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Panama Pacific Dental Congress

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Panama Pacific International Exposition

Charles C. Moore
President of Exposition

1915

James A. Barr
Director of Congresses

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Papers Presented in Section VII.

Orthodontia.

Chairman's Address.

Dr. J. Lowe Young, New York City.

Ladies and gentlemen of the Section, I deem it a very great honor to have been selected to preside over the deliberations of a Section of this great Congress and in behalf of the science of orthodontia, I take great pleasure in welcoming you to the meetings of this Section.

The importance that orthodontia has attained during the past two decades is little short of marvelous, and its teachings are responsible in no slight degree for pronounced advances in other branches of the mother profession. This is due to the fact that normal occlusion of the teeth has been adopted as the standard or the ideal to be attained in all restorations of the dental organs.

Importance of Normal Occlusion.

It is a well recognized fact that where teeth are normal occlusion they are in the very best position to perform all of their various functions. It is a fact that normal occlusion of the teeth is always associated with the best facial balance for that particular individual. It is a fact that the more perfectly teeth functionate the more easily they can be kept clean. It is a fact that in proportion as teeth are kept clean are they free from caries. It is a fact that normal function of the teeth is the greatest factor in preventing diseases of the immediate tissues surrounding them.

Early Treatment.

Within the last few years the men in the medical profession have recognized the possibility of grave systemic disturbances, having their inception in diseased dental tissues. This is a great advance, and yet it is almost certain that only the extreme cases are recognized. In the future the condition of the oral cavity is bound to demand their attention more and more; and as they become skilled and are able to accurately discern deviation from the normal, they will insist on a higher order of art on the part of the dental profession. This will obviate the necessity of orthodontists being called on to treat young men and women with pronounced malocclusions, who on being asked why they delayed

treatment till their late teens, answer that their dentist assured them several years previously that Nature would correct the conditions.

A forest fire that will devastate a region may have its beginning in a match, which could easily have been extinguished. It therefore behooves us and the dental and medical professions as well, to be most careful to recognize the beginning of deviations from the normal and not to wait until the structure is completed in its natural process before attempting correction.

The highest aim of every orthodontist should be to prevent rather than to correct malocclusion of the permanent teeth, and while I am convinced that it requires a higher order of skill, and in many cases much longer supervision of the patient to do this, the final results are so much superior that it is well worth while.

The more we understand of the physiological eruption of the teeth and the tissue changes surrounding them, the more certain are we to agree that early interference is the proper procedure. When we recognize to what extent exceedingly slight pressure of various kinds may and does cause malocclusion we must recognize the fact that very gentle force, if constant and properly applied, is the logical method of treatment.

And here I cannot resist referring to the pin and tube appliance devised by Dr. Edward H. Angle for the treatment of these conditions. In their use I have found that a .030 wire is sufficient to move the teeth of adults as rapidly as I believe it is warrantable to bring about tooth movement. As there are to be two or more papers on the use of this appliance, I will say nothing further regarding it here.

Orthodontia as a Separate Specialty.

At the last International Dental Congress, held in America it was rather doubtful if orthodontia would be able to exist as a separate specialty of dentistry. In the Chairman's opening address to the Section at that time, we find the following:

"It is practically only since the last great International Dental Congress held in America that men began to adopt orthodontia as an exclusive specialty. Now their numbers are rapidly increasing and in every instance that I know of their efforts are meeting with most gratifying results, and I cannot help venturing the prophecy, that by the time of the meeting of another International Dental Congress in America, orthodontia will be represented by competent, conscientious specialists in every city of the world."

Thus you will see that Dr. Angle was not a false prophet, for the spread of orthodontia as a specialty has been most gratifying and I believe to this one man is due very largely, the credit of establishing ortho-

dontia as a separate specialty. It is to be regretted, however, that for several years he has not seen fit to continue his school for the teaching and the preparing of dental practitioners to specialize in orthodontia.

Post-Graduate Teaching.

It is inevitable that some good post-graduate school will be established for the continuance of this noble work, and I wish to express the hope that wherever such a school may be, a continuance clinic under the absolute supervision of one competent orthodontist will be arranged in conjunction with it. Only in this way can all phases of the work be taught. This school should be open to every ethical dental graduate and should comprise a full college year, and those found worthy and well qualified should be given a degree or at least a certificate.

Meetings of this kind are of value not only from the papers presented, but from the opportunity given for interchange of ideas by men from various parts of the world, who are interested in the art, and it is hoped that there will be a frank expression of views, even if they are in direct opposition to those presented by the essayists.

It is absolutely necessary that such expressions of different views should not be taken as a personal matter. It is hoped that personalities shall be entirely eliminated and that all papers be discussed solely from a scientific standpoint. By so doing we will all derive the most benefit.

The Advantages of Early Treatment.

By Dr. Milton T. Watson, Detroit, Mich.

This paper, hurriedly prepared to take the place of one unavoidably withdrawn at the last moment, is based upon my own clinical experience, and the models shown are but a few of the infinite variety that I am convinced represent forms of malocclusion which, if corrected early and retained for a sufficient length of time, will ordinarily leave the patient without any of the permanent ill effects of the associated evils of malocclusion. I also believe that these same cases would not have yielded equally satisfactory results, so far as the correction of the associated disturbances is concerned, if the treatment had been delayed until even eight or ten years of age, though it would doubtless have been entirely possible to establish very good occlusion in every case at the later age.

In the natural order of things there seems to be a time and place more fitting than any other for the occurrence of events concerned with development, and when Nature is not able to keep up with this schedule, she needs assistance. In the subject under consideration, orthodontic interference seems to be the only available help at this time, and the orthodontist will have a much easier task if he comes to the rescue when Nature is putting forth her own greatest efforts.

Impacted Teeth.

If the treatment of malocclusion or lack of development is begun anywhere from four to six years of age, in the cases where it is clearly indicated, the physical force required to stimulate growth is so slight that it is a negligible quantity, and this is not true of the force required to make corrections in teeth that are approaching complete development. More important, still, is the fact that if you are able to produce a renewal, or to create anew, developmental activity at this very early age, you will avoid the stress and reflex disturbances that result from a large number of what really amounts to impacted teeth. I am convinced that the irritating effect of a jaw full of teeth so crowded together that they are forced into abnormal positions, and their eruption often delayed, is in itself a cause of profound disturbance, much greater in fact than that temporarily produced in correcting cases even where

treatment has been longed delayed; and no reasonable man can deny the fact that some of the more mature patients who have been undergoing orthodontic treatment in the past have suffered serious inconvenience. I am so thoroughly imbued with the greater wisdom and comfort of early treatment that I sincerely wish I might never be called upon to treat a child again who is past eight or nine years of age at the very oldest.

Management of Very Young Children.

There is, I know, an impression quite generally entertained that it is exceedingly difficult to manage such young children successfully, but if one takes advantage of the reasonable and legitimate psychological possibilities, the whole thing can be made to appear almost in the light of a special privilege—to the child—and his confidence and co-operation becomes a joy and a thing not to be trifled with. The love and implicit faith of little children is inspiring, and is bound to touch a responsive chord in any man which will stimulate him in his efforts to make his treatment as nearly without inconvenience or discomfort as possible. As an extreme example of how far this can sometimes be carried, I know one small child who told her mother that the doctor had hurt her a little putting on a band, but she would not tell him because she did not want to make him feel badly. The co-operation of an intelligent mother is also much to be desired, though not always attainable. One of the most marked examples of this recently occurred, when a wee mite of a girl, three or four years old, came in and said: "Doctor, will you please fix my teeth so they will be pretty when I am a big girl?" There had been real mother wisdom at work on that child.

In our work with these little children we, of course, avoid that very trying experience of having patients complain because of the unsightly appearance of appliances. As a matter of fact, not unfrequently, these small children are disappointed because they have fewer bands in sight than some of their little friends. It is, of course, true that with many children who go under treatment early, we are compelled to keep some appliances on until the permanent cuspids erupt, but in the majority of such cases it is possible to make them very inconspicuous. We can also guide incoming rotated teeth into their correct positions by simply attaching little springs or spurs to our lingual retaining arch, allowing these to act as obstructions to the teeth in their efforts to erupt in malposition. It certainly should require no argument to convince an orthodontist that teeth that are thus compelled to erupt in their correct positions are much more liable to permanently remain so than are those that are moved after eruption when the roots are, of course, out of position to an approximately corresponding degree.

Treatment at the Age of Puberty.

In the earlier days, when orthodontic treatment was rarely begun before twelve years of age, there was much discussion, and some difference of opinion, regarding the wisdom of beginning the operation, for girls especially, until after puberty for, of course, begun so late it was certain to involve that somewhat trying period. I think most of us now agree that at such times the treatment often proved a very great additional burden, though in other favorable cases, it seemed to make comparatively little difference. It is, however, a combination of circumstances that should especially be avoided in these days of "high tension" school work, and in a very large measure we are able to do so by stimulating development at any early age. As already mentioned earlier in this paper, it is often necessary to keep simple lingual retainers on the teeth until after puberty, even though the work is begun early, but this is radically different from attempting to move from twenty-four to twenty-eight teeth, most of which have attained practically their full root length, and which would, naturally, require a considerable degree of force to produce the required changes.

Mouth Breathing.

Doctor Cryer has shown by his wonderful dissections of the frozen subject that if the oral space is smaller than normal, the tongue is forced back into the throat when the teeth are closed, and it in turn pushes the soft palate up and back against the post-pharyngeal wall, thus compelling the patient to breathe through the mouth, even though the nasal spaces may be normally developed. This, to my mind, is the one reason more vital than all of the rest, why we should interfere as soon as a positive diagnosis can be made, for by so doing we can actually prevent the long chain of associated evils with which you are all so familiar. In this connection it is also well to bear in mind that this early correction prevents the facial deformity which always accompanies marked malocclusion, especially in those cases belonging to Classes II and III (Angle classification).

Use of Temporary Teeth for Anchorage.

There is another important consideration from a purely dental standpoint. In beginning work for children from four to six years of age we are able to use the temporary teeth for anchorage during the greater part of the treatment and retention and very often during the entire period. This relieves the first permanent molars and the *tissues surrounding them* from a common source of injury. We are forced to the conviction that this is vastly more important than was formerly recognized.

There is, of course, an opportunity for a difference of opinion often in regard to the need for treatment of the cases under seven years of age, though, so far as I know, all orthodontists agree that those of a well-marked type, belonging to either Class II or III (Angle), should be corrected as early as it is possible to handle a child comfortably. The majority of children can be managed nicely at about four years of age,

Fig. 1.

and some even earlier, though I believe four to be sufficiently early. If a child happens to be of an extremely timid nature, I would much rather wait until six years of age than to frighten him unduly, or to fail in gaining the necessary confidence.

Need of Early Treatment in Class I.

Perhaps the most common type with which we come in contact, and the one where the greatest difference of opinion prevails, is a Class I case in which we find developmental spaces utterly lacking. I have watched many of these cases, ever since I first became seriously interested in the subject of early treatment, and based

Fig. 2

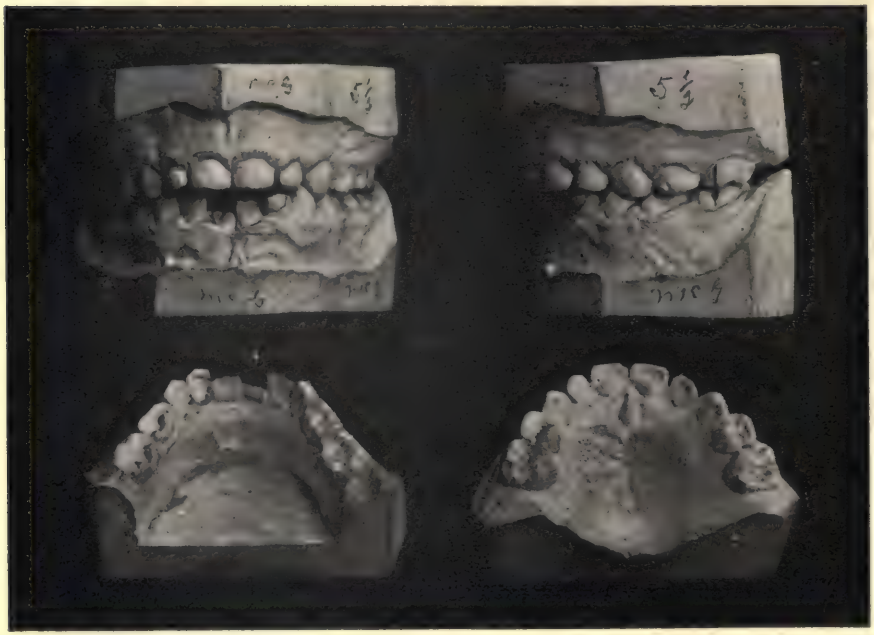


Fig. 3.

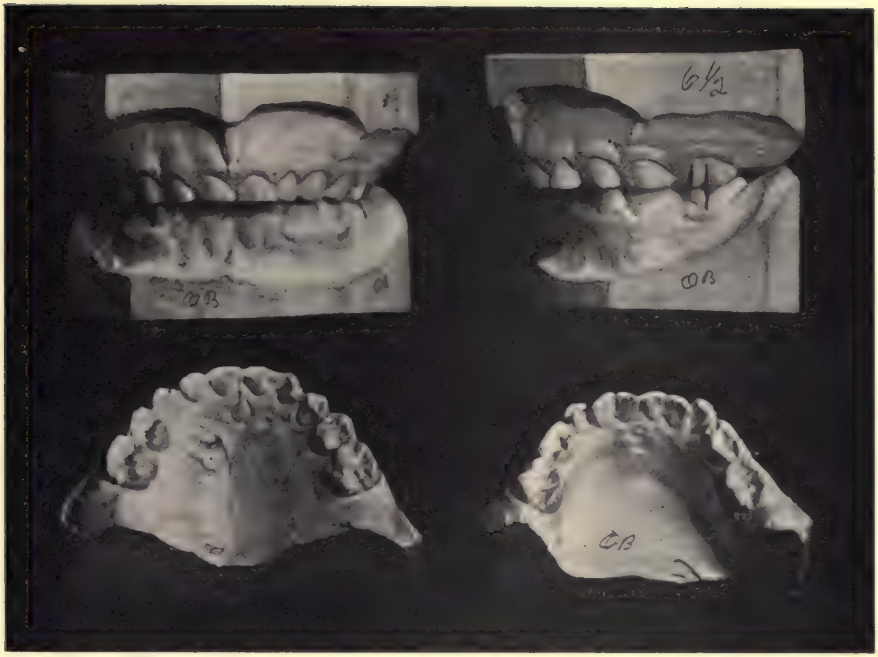


Fig. 4.

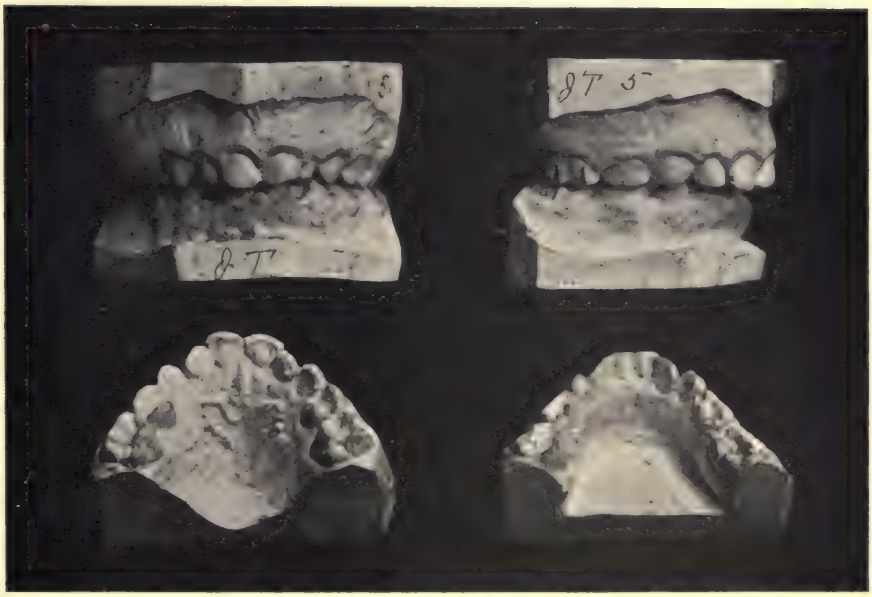


Fig. 5.

on this clinical experience, have arrived at the following conclusions: A child whose general development, including the jaws, is quite normal, will begin to show very slight spacing between the anterior teeth at about four years of age, and this, of course, should progress rapidly enough to provide the necessary room for the larger permanent teeth. If, however, a child's *general* development is somewhat slower than the average,

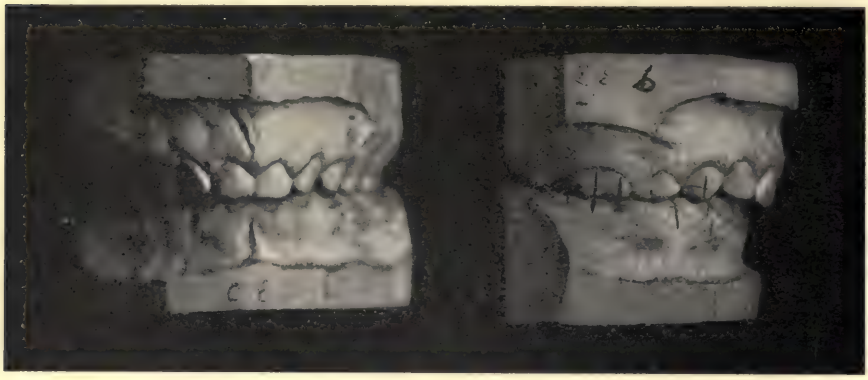


Fig. 6.

we may expect the spacing to occur at a correspondingly later time. The point I would like to make clear here is, that if the jaw development is clearly slower than the general development, then you may look for a malocclusion to result, unless interference is begun early. In my own experience I have never seen a child develop a normal occlusion whose temporary dental arches showed absolutely no additional growth at five years of age.

In a paper before the American Society of Orthodontists, in Toronto, in July, 1914, Dr. Kemple, of New York, showed a few models in which a very fair occlusion had resulted from unpromising earlier conditions. I can only conclude, however, that these were exceptional cases, for I have been unable to duplicate them in my own experience. His paper served a useful purpose, however, for he emphasized the fact that cases have been treated early which did not require it at that time and probably never would have needed much, if any, attention.

Wire-Stretching Appliances.

Among the most gratifying cases I have ever handled are some where developmental spaces not only failed to appear, but where even the temporary teeth were crowded from their correct positions because of the lack of space, and where the only treatment used was either a lingual arch, attached to the second temporary molars, and in a few

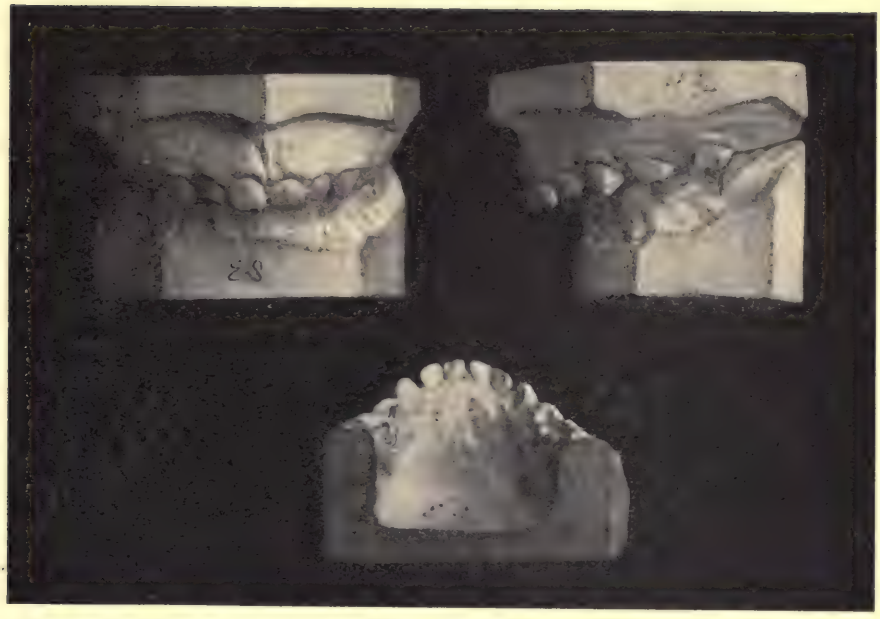


Fig. 7.

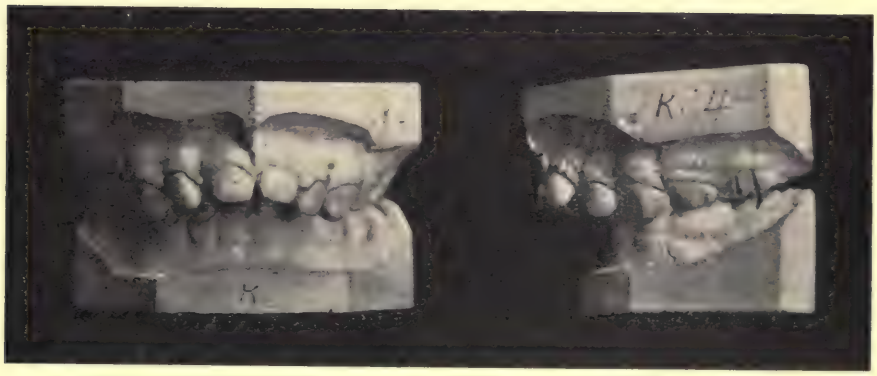


Fig. 8.

cases merely a lingual wire from cuspid to cuspid with extensions pointing distally to engage the first temporary molars. These lingual arches, or cuspid to cuspid wires, were pinched *slightly* with the wire-stretching pliers every week or ten days, until the dental arches were sufficiently enlarged, great care being taken, of course, not to rotate the molars in cases where the lingual arch was the appliance used. Dr. Lloyd S. Lourie, of Chicago, has accomplished more with this simple appliance than any man I know.

One of the most pronounced cases of Class I which I have handled was treated with a .030" platinum-gold lingual arch with three small loops in it, which were gradually straightened out, thus lengthening and widening the dental arches to the required degree. I believe, however, that the iridio-platinum lingual arch and the wire stretchers, as used by Dr. Lourie, is a simpler method. His plan of cutting a slight groove very near the end of the beaks on an Angle wire-stretcher has, to my mind at least, wonderfully increased the usefulness of that instrument, and the work he accomplishes without having any appliances in view in some cases is perhaps the greatest advance in modern appliance technique, and overcomes one of the principal objections to the long wearing of appliances, namely, the possible ill effects upon gums and teeth of complicated apparatus that is difficult to cleanse properly. Dr. Lourie has also designed a new wire-stretching appliance, which produces a much greater elongation of the wire without materially weakening it, and which is so shaped that the lingual arch can be readily grasped with the instrument. It was not my intention originally to mention appliances, but I believe Dr. Lourie's work should be brought more generally to the attention of the profession, and it is for this reason that I have digressed somewhat.

Cases from Practice.

Case I.

Fig. 1 is a six-year-old child who had been under observation for a year. The parents were doubtful regarding the necessity for treatment when the case first presented, and delayed treatment until the lower central incisors began to erupt very much rotated and completely in lingual relation to the line of occlusion.

Case II.

Fig. 2 is a six-year-old child where the general development was much better than the jaw development. Treatment was unavoidably delayed for nearly a year, during which time the lower lateral incisors erupted very much rotated and in a position decidedly lingual to normal.

Case III.

This child at five and one-half years of age presents a Class I case, where almost no jaw development has taken place since the eruption of the temporary teeth (Fig. 3). The lower permanent centrals are erupting, somewhat rotated and slightly in lingual occlusion, but at the expense of the roots of the temporary laterals, both of which are all but ready to fall out. This case was controlled entirely with a lingual arch, except that one upper incisor required a Magill band to assist in rotating it. At this time the permanent teeth, except the upper cuspids, have all erupted, and there are no appliances in the mouth. The only attachment made to a permanent tooth was the Magill band on the upper incisor.

Case IV. Fig. 4 represents the models of a child six and one-half years of age who has a Class II, Div. I, malocclusion. There are no developmental spaces in either jaw—in fact, the teeth are so close together that the lower incisors are considerably rotated.

Case V. This child, five years of age, presents a complete distal occlusion, with both arches very much constricted, and accompanied by marked interference with the breathing capacity, even after the usual post-nasal operation (Fig. 5). The arches were widened and the mesio-distal relations corrected, but notwithstanding this the incisors have all erupted in rotated positions, which has been corrected, however, by the lingual retaining arch acting as an obstruction, and thus compelling the teeth to gradually occupy the correct position as they erupted.

Case VI. This child at six years of age presents a complete distal occlusion, the upper arch showing no developmental spaces, and the lower only slight ones, with the permanent lower centrals erupting in lingual relations to the temporary incisors which are still in position (Fig. 6).

Case VII. Fig. 7 shows not only a well-marked case of the 1st Div. of Class II, but is complicated by the lower incisors occluding with the soft tissues in the roof of the mouth unusually high up, due to their excessive eruption as compared with that of the temporary molars. This child is only four and one-half years old.

Case VIII. This little four-year-old child (Fig. 8) represents a much simpler type of the First Div. of Class II than the previous one, as it is not complicated by any marked elongation of the incisors. The widening of the upper arch in the region of the cuspids allowed the lower jaw to advance bodily to a considerable degree, after which intermaxillary elastics were adjusted and the mesio-distal relations completely corrected with the greatest ease.

These few illustrations all show types of malocclusion which, in my experience, yield more profound results than I have ordinarily been able to obtain in dealing with older children, the apparent reasons for which have already been touched upon at some length.

Control of The Overbite in Treatment of Class II Cases.

By Dr. Herbert A. Pullen, Buffalo, N. Y.

The abnormal relations of the dental arches in malocclusion, in which there exists the condition known as the "abnormal overbite," is one that will bear considerable study beyond our present conceptions of its etiology, diagnosis and treatment before the causation of all of its peculiarities in development is perfectly understood and its baffling difficulties in treatment mastered.

All too often have cases of malocclusion been treated in which the abnormal overbite has been overlooked, or regarded as an irremediable typal defect, with the result that the most important factor of the malocclusion has remained untreated, a condition being left which invariably inhibits the results of other treatment through its abnormal influence upon the occlusal planes of the dental arches, and upon the inclined planes of the individual teeth.

In fact, it has only been within the last few years that a determined effort has been made among orthodontists to analyze the variations from the normal in the development of the occlusal plane, and to correct these conditions by the application of scientific principles of treatment, whereby the occlusal planes are corrected in their maldevelopment and the normal overbite restored.

Just at this point it is essential that we distinguish between what is known as the overlap and the overbite of the teeth. They may be defined as follows:

Overlap. The overlap, strictly speaking, is the distance the upper incisors and cuspids cover the lower incisors and cuspids when in contact. This may be normal or abnormal.

Normal Overbite. *The normal overbite is the normal overlap of the upper incisors over the lower, as governed by the proportionate length of cusps in bicuspids and molars and by the normal development of the occlusal plane.*

Let us examine for a moment the normal denture and observe a normal overbite, its relation to the occlusion of the rest of the teeth, and

to the occlusal plane, and, by comparison, determine to some definite degree what the normal overbite is; in other words, make a differential diagnosis between the normal and abnormal overbite.

In Fig. 1, a skull exhibiting normal occlusion, the normal overbite is represented by the normal overlapping of the upper incisors over the

Fig. 1

lower incisors to a degree commensurate with the depth of the cusps of the bicuspids and molars, and in proportion to the level of the normal occlusal plane and to its curve.

The normal relations of the incisal edges of the lower incisors to the upper incisors in occlusion is in contact with the lingual inclined planes of the upper incisors below the lingual ridges. This is recognized as the normal overbite and overlap.

The degree of contact of the labial surfaces of the lower incisors with the lingual surfaces of the upper incisors will vary according to the normal angles of labial inclination of the upper and lower incisors, varying somewhat with type and temperament.

The average depth of the normal overlap is about one-third the length of the crowns of the incisors, varying also according to type and

temperament, being greater in the bilious and nervous temperaments, and less in the sanguineous and lymphatic types.

Black says: "The incisors and cuspids occlude so that the cutting edges of the lower incisors and cusps of the cuspids make contact with the lingual surfaces of the similar teeth of the upper jaw near their cutting edges. In this, however, there is much variety within the limits

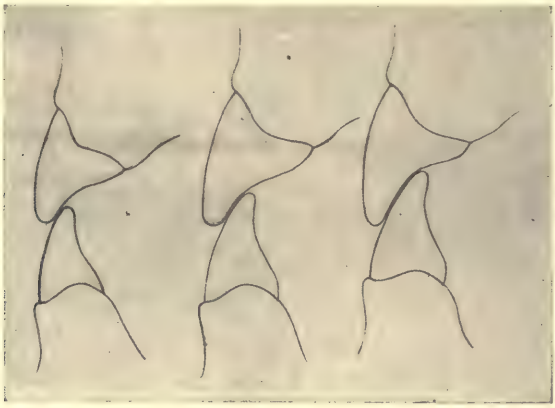


Fig. 2

of a normal occlusion. Sometimes the lower incisors strike the lingual surfaces of the upper near the linguo-gingival ridge and may strike at any point between that and the cutting edges." *The linguo-gingival ridge of the upper incisors is thus seen to be the point below which the normal overlap and overbite are confined.*

These variations in the normal overlap and overbite are diagrammatically shown in Fig. 2.

The depth of the normal overbite, in which the lower incisors occlude below the linguo-gingival ridge of the upper incisors, bears a certain relationship to the depth of the cusps of the bicuspids and molars, in that a deep overbite accompanies deep cusps in the bicuspids and molars, and a short overbite is associated with correspondingly short cusps in the bicuspids and molars, as illustrated in Fig. 3.

The depth of the overbite also bears a peculiar relation to the curve of Spee, or the normal horizontal curved occlusal plane. In Fig. 4 is illustrated in diagram the relation of the curve of Spee, which is an imaginary line beginning at the incisal edges of the lower incisors and touching the tips of the cusps of the cuspids, and the crests of the buccal cusps of the bicuspids and molars, extending, if projected distally, along

the anterior face of the articular surface of the condyle. According to Turner, this curve more frequently passes posterior to the anterior face of the condyle than anterior to it.

When the overbite is normally shallow, as in the cast on the right of Fig. 5, the curve of Spee is long and less perceptible; when the overbite is extensive and the overlap abnormally deep this curve is shorter, its

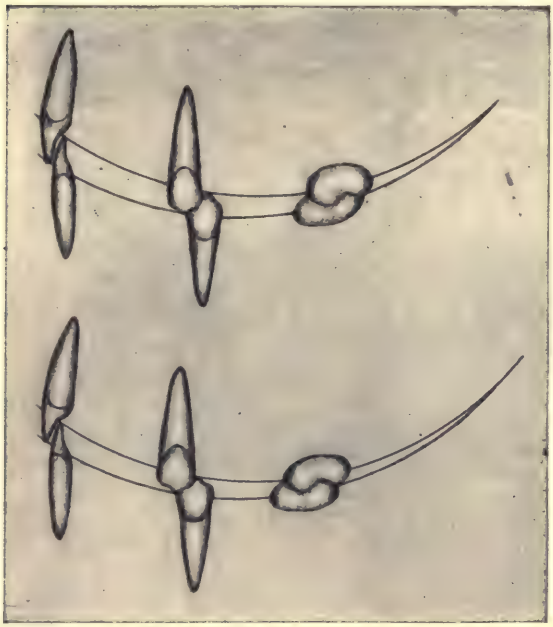


Fig. 3

Fig. 4

concavity is exaggerated deeply, the incisal edges appearing much higher than the cusps of the bicuspids, as in the cast on the left in Fig. 5.

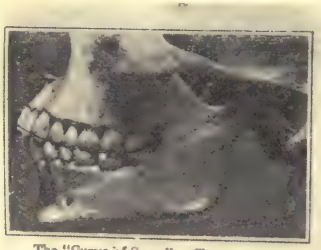
Fig. 6 exhibits a short cusped overbite with a long curve of Spee.

Variations of Abnormal Overbite.

The abnormal overbite may vary in extent from a slight infringement of the edges of the lower incisors upon the lingual ridges of the upper incisors to an extreme malocclusion in which the edges of the lower incisors occlude with the gums three-quarters of an inch or more lingual to the upper incisors. Fig. 7 exhibits three positions of abnormal overbite, between which many intermediate degrees might be represented.

The abnormal overbite may thus be considered as beginning where

Fig. 5



The "Curve of Spee." Short cusps and long curve. Line passing through anterior face of condyle. (Specimen No. 4237, Wistar Institute of Anatomy.)

The "Curve of Spee." Short cusps and long curve. Line passing distal to anterior face of condyle. (From photograph of specimen No. 800, Wistar Institute of Anatomy.)

Fig. 6

Fig. 7

the normal overbite ends, viz., at the lingual ridge of the upper incisors. That is, the differentiation of abnormality is the occlusion of the lower incisors on the inclines of the lingual ridges of the upper incisors, or on the gums lingual to them.

These variations in the abnormal overbite do not always indicate a distal occlusion, as they occur in Class I, especially in the so-called "upper protrusions," as well as in the divisions of Class II, and determine in a measure the extent of arrested or deficient development in the

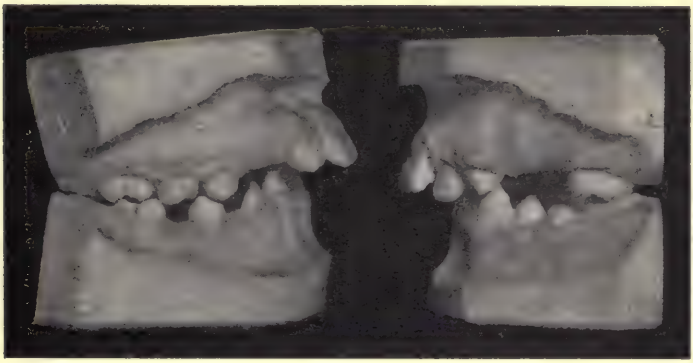


Fig. 8. Fig. 9.

vertical growth of the dental arches in these cases, and in their correction the degree of perfection of results in occlusion and harmony of facial lines.

Abnormal Overbite and Facial Inharmony.

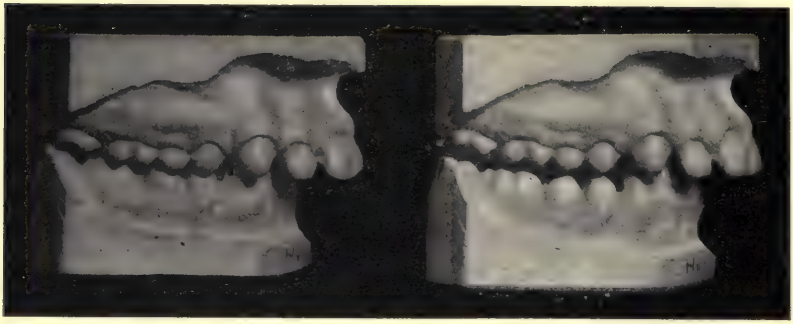
Any marked change from the normal in occlusion is easily noticed in the facial lines, and the deep overbite, especially in the "upper protrusions" of Class I and the first division of Class II, exhibits a very noticeable facial inharmony. The degree of facial inharmony in these cases is also measured by the depth of the overbite and the distance between the lingual cutting edges of the upper incisors and the labial cutting edges of the lower incisors.

Fig. 8 exhibits an abnormally deep overbite of Class I, and Fig. 9 and abnormally deep overbite of Class II, and it will be observed that except for the mesio-distal variation from the normal in occlusion of the bicuspids and molars the anterior malocclusion is identically the same. Likewise, it would be difficult to determine from a study of the profiles alone in which one the distal occlusion exists.

Structural Changes in Development.

A further analysis of these cases reveals certain structural defects in the development of the dental arches which accounts for the production of the deep overbite, and which gives a clue to the only practical method of treatment.

If the casts of a case exhibiting the deep overbite, as in a, Fig. 10, be separated in parallel planes and the incisal portions placed in the positions of a normal overbite, b, it will be noted that the bicuspids and molars are separated to a marked extent, and that this position marks in



a Fig. 10. b

a general way the normal plane of occlusion, and also that the width of this space between the dental arches measures the lack of development in the dental arches. This would indicate that there is in these cases a *lack of downward vertical development* in the upper dental arch and of *upward vertical development* in the lower dental arch.

Dr. A. P. Rogers, in a paper before the American Society of Orthodontists, describes the incipiency of this condition as follows: "During that period of transition between the loss of the deciduous and the complete eruption of the permanent teeth, there is a gradual growth of the face in length, breadth and depth. The length is influenced very largely by the increased vertical development of the teeth and their processes. It is during this period, in normal cases, that a new and correct occlusal plane is developed; but in those cases where abnormal influences are introduced there is a destruction of occlusal balance frequently resulting in maldevelopment of the occlusal plane."

These inequalities in growth in the dental arches are not caused by the abnormal occlusal relations, but instead, the abnormal occlusal relations are determined by the degree of arrested or deficient development

in the vertical growth of the dental arches. The inhibition in nutrition and lack of stimulus to normal vertical growth in the dental arches thus interferes with the development of the *normal occlusal plane.*

Inhibitory Influences in Development of the Occlusal Plane.

Just what these inhibitory influences are in the development of the occlusal plane is difficult to determine accurately, as a number of factors may combine in the maldevelopment.

A deficiency in the use of the muscles of mastication and deglutition,

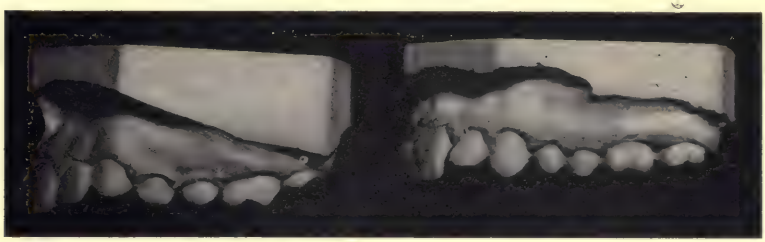


Fig. 11.

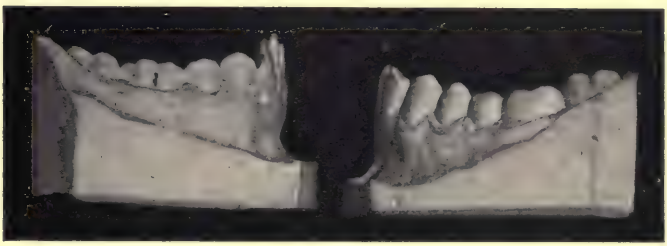


Fig. 12.

as well as a lack of respiratory function, as noted by Dr. F. B. Noyes, may each have a share in this inhibitory influence in development of the bony structures of the dental arches.

Again, the causative factor may be a lack of the stimulating action on development produced by the pituitary and other glands of internal secretion.

These conditions of maldevelopment found in connection with the deep overbite may or may not be associated with mouth-breathing and an unhealthy tonsillar ring. Adenoids and mouth-breathing may be as much a symptom of derangement of functions as is the arrested or deficient development of the dental arches.

There is lacking, at any rate, that stimulus to normal development of the dental arches which, if not provided by the orthodontist, will otherwise never be initiated, so that when the permanent teeth are all erupted, the occlusion is entirely out of balance, and the forces of malocclusion establish and confirm the abnormal overbite and other symptoms of the maldevelopment.

In many cases of this kind the normal plane of occlusion of the upper arch is just reversed, as in Fig. 11, with an apparent elongation of the upper incisors. It is not improbable in some cases of this nature that there is a slight overdevelopment in the vertical plane in the incisor region.

In other cases, the curve of the occlusal plane of the lower arch is deeply exaggerated, as in Fig. 12, the lower incisors seeming elongated and the bicuspids depressed.

Structurally, then, there is apparent in connection with the deep overbite the lack of vertical development, or infra-occlusion in the regions of the bicuspids and molars in one or both of the dental arches, a possible overdevelopment in the incisal region in some cases, and at the same time a marked deviation of the plane of occlusion from the normal.

The dental arches may also be lacking in growth, in length and breadth, while exhibiting all the symptoms of maldevelopment in connection with the deep overbite.

Some orthodontists believe that there is no supra-occlusion of the incisors in these cases of excessive overbite, but that in Class II, Div. II cases, for example, the "incisors which were apparently in supra-occlusion had in reality only reached their proper positions, and, by reason of the infra-occlusion of the molars, usually the lower, the incisors were allowed to glide past each other."

Dr. R. W. Strang,* in an article on the etiology of Class II. Div. II, notes the "omnipresent overbite," and suggests the possibility of the excessive overbite causing the distal occlusion. He remarks as follows: "With this normal overlapping in the incisor and cuspid region in the deciduous arches, we find six inches pre-eminently and unnaturally active. They are formed by the lingual surfaces of the upper incisors and cuspids and the labial surfaces of the lower incisors and cuspids. In this abnormal position they at once become the longest, the most powerful, and, therefore, the most positive of all the inclines in action at this age."

"One of three conditions must arise or a combination of two or all of them: (1) Either the upper incisors must be carried labially; (2) the

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* R. W. Strang, American Orthodontist.

lower incisors must be carried lingually; (3) or the mandible must be forced distally."

The first of these conditions, or the labial movement of the upper incisors with separation in the deep overbites of Class I, has been frequently noted by the writer. Fig. 13 illustrates such a case in Class I, the lower incisors occluding well above the lingual ridges of the upper incisors which are protruded and separated.

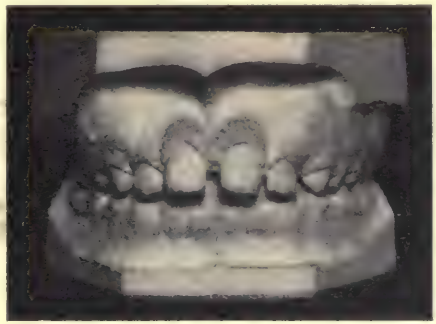


Fig. 13.

The second possibility, or the lingual movement of the lower incisors, due to the force of the inclined planes in the deep overbite, occurs less frequently, but may occasionally be noted.

The third result or the distal displacement of the mandible by the deep overbite in cases of Class II, Div. II, the writer has not as yet been able to verify in his own practice, but it is not improbable, although the distal position of the lower arch may in some cases occur even before the eruption of the deciduous incisors, when the abnormal overbite would be a secondary effect, conformative to the distal relation.

In some cases, more frequently in Class II, the abnormally deep overbite has caused the lower incisors to bite deeply into the gums lingual to the upper incisors so that inflammation and soreness of the gums develop. In one of the writer's cases, the pain from this cause was enough to cause nausea after each meal, which immediately subsided after "opening the bite" sufficiently to relieve the lower incisors from contact with the gums.

Also, in cases of abnormal overbite, the temporo-mandibular articulation shares in the structural and functional derangement to the same degree to which the dental arches are arrested in their vertical development, and only after correction of the malocclusion does the full function of articulation come into play.

Early Methods of Treatment of the Abnormally Deep Overbite.

The first efforts at correction of a malocclusion exhibiting these defects were directed at the treatment of its most prominent characteristic or symptom, so to speak, viz., at a depression of the lower incisors in their sockets and a retrusion of the upper incisors at a time when the classification of malocclusions was unknown. Frequently it was advised to extract one or more bicuspids from the upper arch and retract the incisors and cuspids.

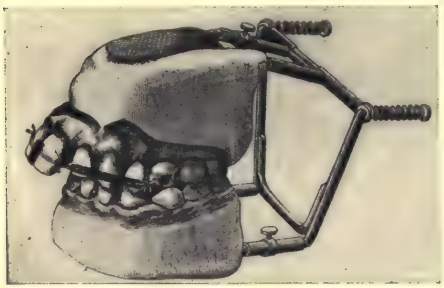


Fig. 14.

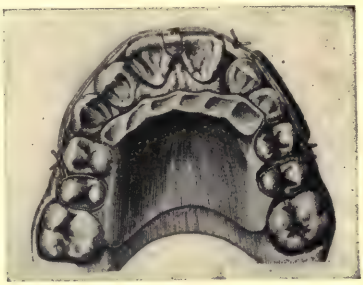


Fig. 15.

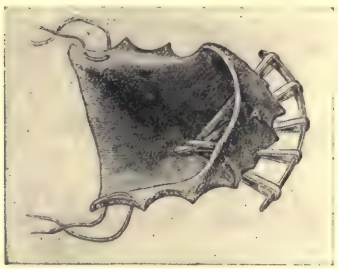


Fig. 16.

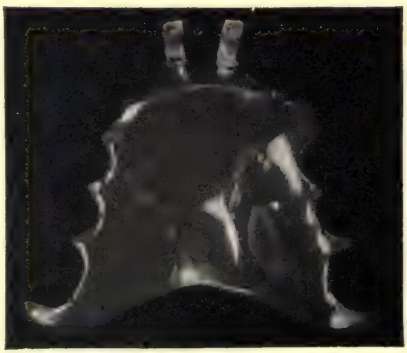


Fig. 17.

One of the earliest efforts at correction of a case presenting with the deep "overbite" is described by Bonwill in *"Harris's Principles and Practice."* Apparently a case of Class II, Div. I, it presented unusual difficulties, as may be seen from Fig. 14, the casts being placed in Bonwill's articulator for study of the positions of the teeth and relations of the dental arches in articulation. The history of the case showed that the arches of the temporary teeth were normal and the cause of the condition was obscure.

The lower incisors were three-eighths of an inch distant from the upper incisors, and were biting into the gums lingually to the upper incisors. In attempting the correction of this case, illustrated in Fig. 15, Bonwill made use of a roofplate "thickened where the lower teeth would touch" sufficiently to "open the bite" about one-eighth of an inch, as he described it. "This was not only to drive the inferior incisors up farther into their sockets, but to allow the bicuspids and molars to come down and antagonize before the plate was removed."

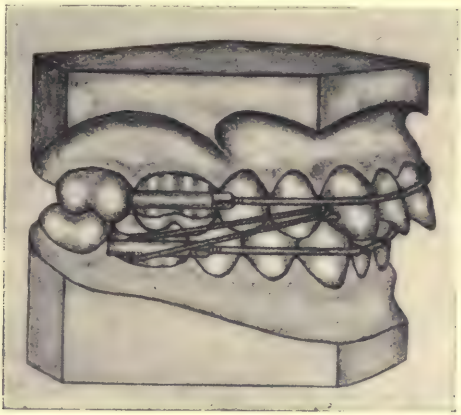


Fig. 18

"Two years were consumed in this. To this plate I now attached a rubber band around the arch with a silk ligature, and at the central incisors I made a metal hook, carried over their cutting edges with two holes through which the ligature passed. This kept the ligature down on the incisors near the cutting edges, and while it was aiding in drawing in the arch, it did another very important thing, forced the centrals up into the alveolus."

The result of treatment of this case was not published, but no doubt the relations of occlusion, especially of the overbite, were improved, and by the partial use of a principle which is not far different from part of the apparatus in use at the present day.

Kingsley describes the use of a roofplate with inclined plane, as shown in Fig. 16, for "jumping the bite," which at the same time acted to depress the lower incisors, and by "opening the bite" give the bicuspids and molars an opportunity to develop occlusally.

Passing over the intermediate history of attempts to correct the

deep overbite, which were practically the same until the Angle classification of malocclusion came into use, we can take it up at a time when the etiology and structural development of these cases came to be more specifically studied, and more scientific and definite results in treatment obtained.

Angle described in his textbook (7th ed.) the use of the vulcanite roofplate, with hooks to engage the incisors, Fig. 17, for the purpose of opening the bite before shifting the occlusion in the treatment of the first division of Class II. He remarks concerning this roofplate: "If con-

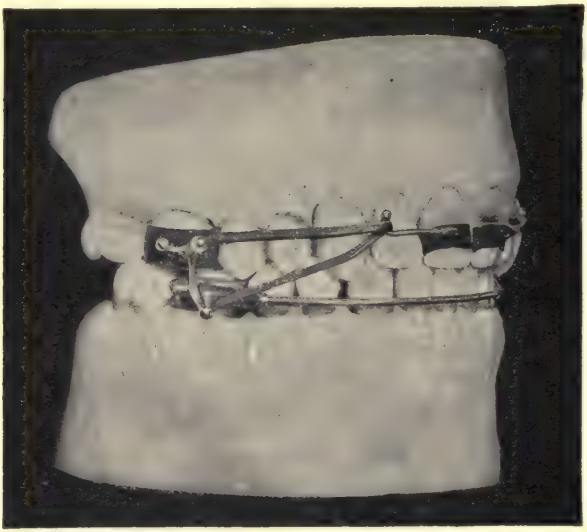


Fig. 19

stantly worn from two to six months, the molars will have become lengthened and the proper length of bite established."

In the treatment of Class II, during the shifting of the occlusion with intermaxillary force, as in Fig. 18, the deep overbite sometimes disappears through the opportunity given for the molars and bicuspids to develop in the vertical plane. More frequently, however, this vertical development in the bicuspid and molar region does not occur at the same time, and it becomes necessary to stimulate this development by appliances especially constructed for this purpose.

The later methods of correcting the abnormal overbite do not depend so much upon the principle of the inclined plane in forcing the incisors into their sockets and allowing the molars to lengthen, as upon a more

scientific combination of appliances adjusted to stimulate the development of those areas of the dental arches, which through their lack of vertical development, cause the abnormally deep overbite, viz., in the regions of the bicuspids and molars.

Dr. A. P. Rogers suggested a method of combining the inclined plane with the use of intermaxillary force, Fig. 19, applied for shifting the occlusion and extruding the molars in the treatment of the first division of Class II, which operates very successfully in some cases. Dr. J. Lowe Young described a looped wire inclined plane, Fig. 20, for use in a similar manner as the inclined plane of Dr. Rogers. The method is ideal in so far as it tends to develop the undeveloped areas of the

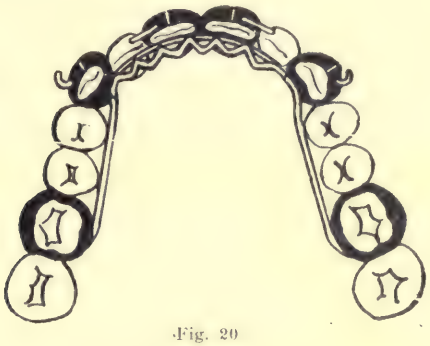


Fig. 20

Fig. 21

upper and lower dental arches in the vertical plane. The fixation of the upper incisors for any length of time through the attachment of the soldered inclined plane to incisor bands is not desirable, and a method of overcoming this defect in construction has been suggested by Dr. C. A. Hawley. It consists in the use of individual inclined planes on each of the incisors, thus giving them perfect freedom in movement. These individual inclined planes, Fig. 21, are made of wire loops bent to form inclined planes and adjusted to the occlusion of the antagonizing incisors in the lower arch.

A method has been suggested for use in cases of "mixed dentures" in which the roots of the deciduous molars are not absorbed, and that is to crown the deciduous molars and open the bite until the overbite is normal, and at the same time to apply intermaxillary force to shift the occlusion from distal to normal and elevate the first permanent molars.

Fig. 22 illustrates a Class II, Div. II case of the writer's partially treated in this manner. The model on the right exhibits the bite opened by the crowns on the deciduous molars. The triangular use of the intermaxillary elastics in this case is shown in the drawing, Fig. 23. This method has some objectionable features, in that it can be used in but few

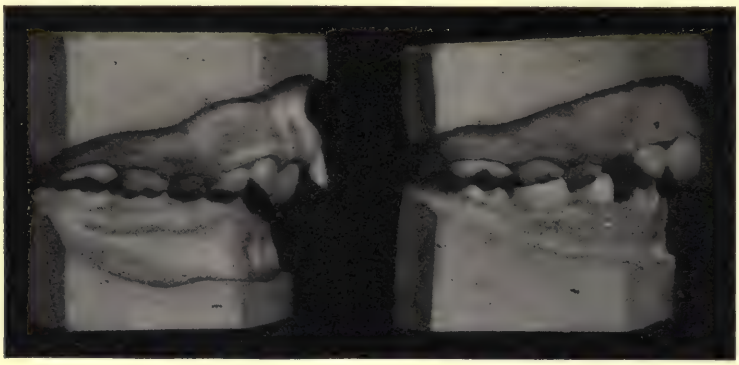


Fig. 22

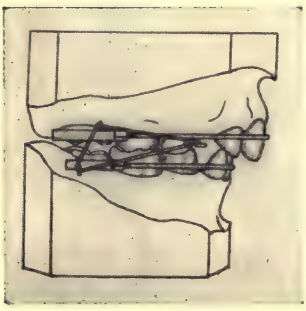


Fig. 23

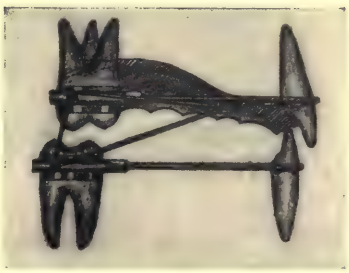


Fig. 24

cases on account of the early absorption of the roots and the loss of the deciduous molars. Again, the pressure of the intermaxillary force tends to force the deciduous molars into their sockets rather than to develop the region of the bicuspids in the vertical plane.

A method which is considerably used by orthodontists for changing the overbite consists in the use of the roofplate with a thickened portion anteriorly in the form of an inclined plane for the lower incisors to be held apart from occlusion with the upper while the expansion arches are adjusted for shifting of the occlusion and extruding the molars at the

same time. This combination is diagrammatically shown in Fig. 24. The operation of the intermaxillary elastics is to produce a force which tends to develop the dental arches vertically while the occlusion is being shifted mesio-distally. The application of the law of the parallelogram of forces, Fig. 25, exhibits the resultant of the force, KD and ED, to be the

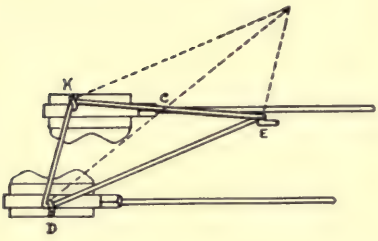


Fig. 25

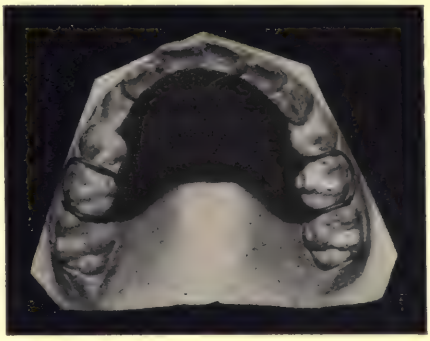


Fig. 26.

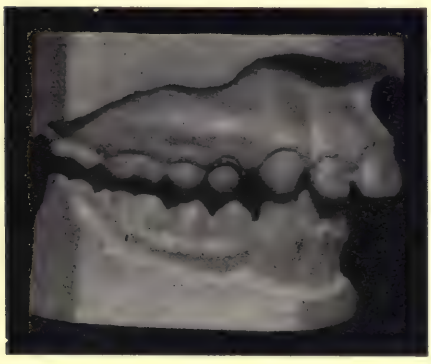


Fig. 27.

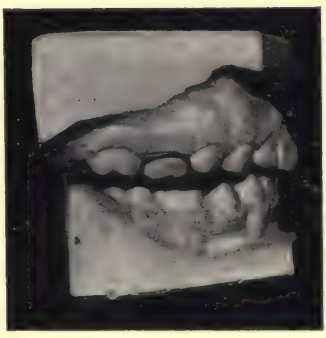


Fig. 28.

force CD, which exerts an upward and forward pressure on the lower arch and a downward and backward pressure on the upper arch.

One difficulty in the use of the roofplate has been its ease of removal from the mouth, this being fully as undesirable as the fixation of the incisors with the gold inclined plane, and the writer has adopted the additional use of the Jackson cribs to assist in holding the roofplate in place, as in Fig. 26. By means of these cribs the plate may be made much shorter and it will interfere less with the speech.

The cribs are first made upon the bicuspid teeth in the permanent

arch, as in Fig. 27, or upon the deciduous molars, if in the deciduous arch, Fig. 28, and their ends imbedded in the wax baseplate, the inclined plane of which is adjusted to the lower incisors with the casts in the position of correct occlusion, and from this wax pattern the vulcanite plate is made. The expansion arches are then adjusted upon the teeth as in the treatment of the first division of Class II, shown in Fig. 18.

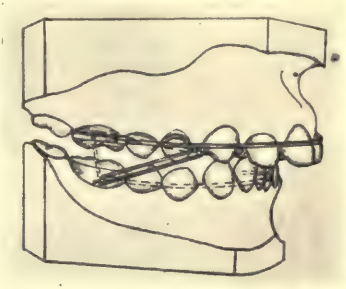


Fig. 29.

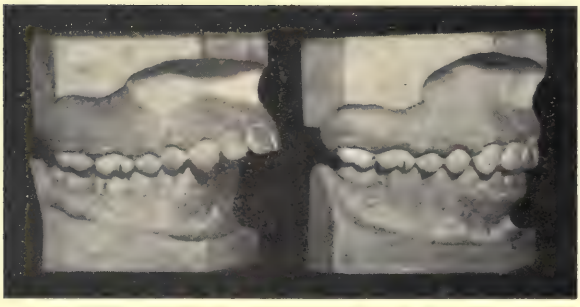


Fig. 30.

The expansion arch is used in the beginning on both upper and lower dental arches until their correct shape has been obtained, after which a removable lingual arch may be substituted for the lower expansion arch, the roof plate with inclined plane inserted, and the intermaxillary elastics adjusted, first from the hooks on the upper expansion arch to the hooks on the lower molar bands and later in the triangular position, as shown by the dotted lines in Fig. 29.

The neatest construction of the removable inclined plane is that suggested by Dr. J. Lowe Young in the cast inclined plane, which is at-

tached to a lingual arch provided at its extremities with half oval rods fitting into half oval tubes on the lingual surface of molar bands.

These methods of treatment which have just been described are more adaptable for treatment of the mixed dentures in which the bicuspids have not erupted, for after the eruption of these teeth it is evident that the extruding of the molars will have very little influence on the vertical development of the occlusal plane in the bicuspid region.

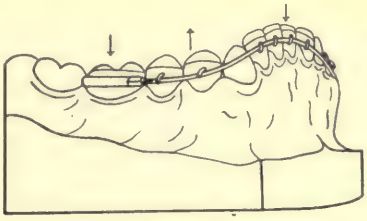


Fig. 31.

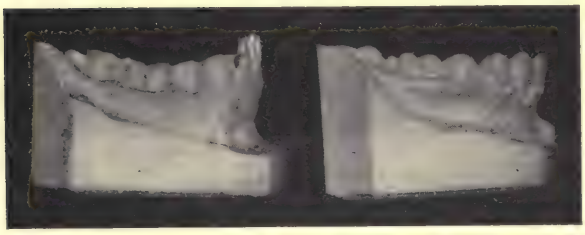


Fig. 32.

In the permanent denture the curve of the occlusal plane can be plainly seen and its degree of abnormality easily observed by studying the movements of the mandible in articulation. The correction of the occlusal plane may be confined to either one or the other of the two dental arches, according as to which arch exhibits the predominating abnormal curve.

For example, in Fig. 30, a case of Class II, Div. I, with an abnormally deep overbite, the lower dental arch is decidedly the one exhibiting the greatest degree of abnormality in the occlusal plane, the incisors being much higher than the bicuspids and the application of another method of treatment than heretofore described is necessary.

The use of the expansion arch as a double elastic lever, in a somewhat similar manner to that first described by Dr. C. S. Case, is especially applicable in these cases. The expansion arch was adjusted for this case, as in Fig. 31, under hooks on bicuspid bands and over hooks on incisor

bands for changing the abnormal occlusal plane. Fig. 32 represents the change in the occlusal plane of the lower arch after this treatment.

The rest of the treatment does not differ from the usual treatment of Class II, Div. 1, in which the occlusal plane of the lower arch is not changed. The combination of appliances for shifting the occlusion and changing the occlusal plane of the lower arch at the same time is shown in Fig. 33.

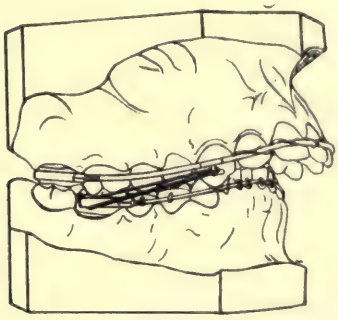


Fig. 33.

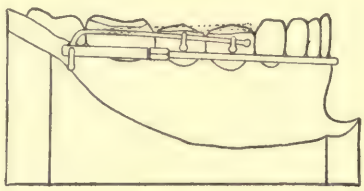


Fig. 34.

Fig. 30 illustrates the before and after treatment models of the case, and the restoration of normal occlusal relations.

In some cases in which the occlusal plane of the lower arch is abnormal, it may be corrected by elevating or extruding the bicuspids with the elastic spring lever, Fig. 34, as described by Dr. J. Lowe Young. The lever is attached at the distal end of the buccal tube and engages anteriorly with buccal hooks on the bicuspid bands, being sprung downward into position.

In many cases the abnormal curve in the occlusal plane is found in the upper arch, as in Fig. 35, a Class I case with an abnormally deep overbite. By comparing the casts of the upper arches before and after treatment in Fig. 36, the change in the curve of the occlusal plane will be seen to be exactly reversed.

The upper incisors were in supra-occlusion and were intruded in their sockets while the bicuspids were extruded. This change may be made in precisely the same manner as described for the change in the occlusal plane of the lower arch.

One objection to the use of the threaded expansion arch in cases of this kind is the difficulty of inserting it in or removing it from the horizontal buccal tubes. This may be overcome by the use of a horizontal buccal tube which has an attachment allowing its removal in the vertical

plane, as in Fig. 37, in which is shown a horizontal buccal tube with an oval rod attached, engaging a vertically placed oval tube, locked by a spring catch extending from the horizontal buccal tube to the end of the vertical oval tube.

A simpler method is to use a .030-inch threadless arch, Fig. 38, with the vertical oval rod and tube anchorage, and a loop placed anterior to the anchor tube for lengthening the arch wire when necessary. The

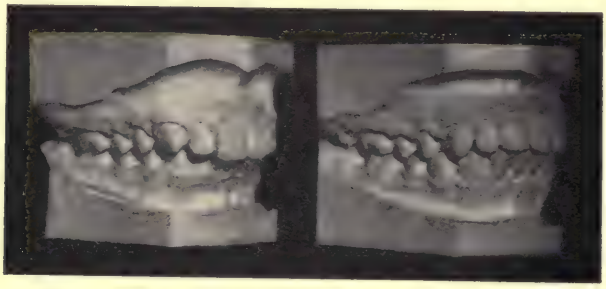


Fig. 35.

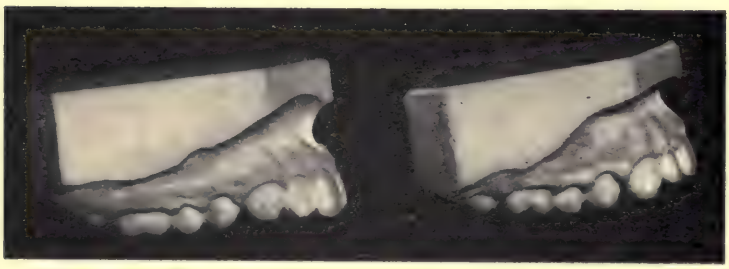


Fig. 36.

change in the curve of the occlusal plane by this method is diagrammatically shown in the lower drawing in Fig. 38.

Summary. In connection with the treatment of the abnormally deep overbite in either Class I or II, the dental arches should be first developed laterally and anteriorly, so as to restore their normal sizes and forms, and secondly, appliances should be adjusted for the correction of the abnormal overbite. Especially in the second division of Class II it is quite frequently observed that the distal occlusion requires but little treatment after the dental arches have been expanded, the release from the condition of contracted dental arches often allowing the distal occlusion to change to

normal without the use of intermaxillary force, and after the occlusal plane of the dental arches has been restored the overbite becomes normal.

An analysis of the structural maldevelopment in connection with the deep overbite reveals two chief factors, the lack of vertical development in the bicuspid and molar region and the inhibition in development of the normal occlusal plane. The temporo-mandibular articulation also shares in this deficiency in structural relation.

Fig. 37.

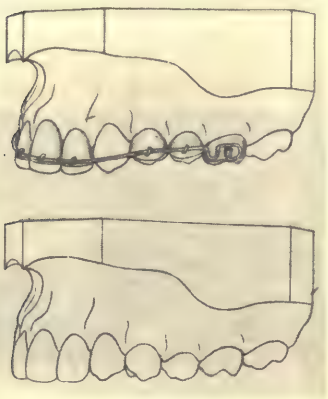


Fig. 38.

The facial inharmony has been shown to be proportionate to the degree of depth of the abnormal overbite, and symptomatic of this condition to a large extent.

It is suggested that in view of the similarity in maldevelopment, malocclusion, and facial inharmony in many of the "upper protrusions" of Class I with the deep overbite, and the cases of Class II, Div. I, with the deep underbite, that the distal occlusion is more of an incidental characteristic in the Class II cases, rather than a vitally important factor in the differential diagnosis. The distal occlusion, however, establishes the only indication for a mesio-distal change in the occlusal relations in Class II

cases beyond the similar treatment for the deep overbite in Class I and Class II by stimulating vertical development in the bicuspid and molar region and establishment of the normal occlusal plane and normal overbite.

The inhibitory influences in development causing the abnormally deep overbite and abnormal occlusal plane are thought to be largely nutritional, possibly lack of pituitary function, and also lack of proper stimulating force in development due to insufficient masticatory function and deglutition, as well as deficient respiratory function.

The history of the treatment of cases exhibiting the deep overbite shows a progressively scientific treatment based upon the known etiology as well as upon the theoretical causative factors.

The mechanical stimulation of undeveloped areas in connection with the correction of the abnormally deep overbite must be supplemented by the establishment of normal masticatory function, normal deglutition, the initiation of normal respiratory function, and, if possible, by the correction of defective metabolism and nutrition, and deficient functioning of the glands of internal secretion which control bodily growth.

The investigation of the causative factors in connection with the abnormally deep overbite, as well as in many of the pronounced malocclusions of the dental arches, shows the necessity for a broader understanding of the factors influential in bodily growth as a whole, and the extent of the overlap of orthodontia into the field of medical research, to investigators to whom we must look to supply the missing links in developmental possibilities beyond which we are unable to progress without further specific knowledge.

An Instrument for Surveying and Mapping the Denture.

Frederick Lester Stanton, D.D.S., and Rudolph L. Hanau, Dipl.-Ing.

In the Fall of 1914, an investigation was started to study the question of the relative heights of teeth. This communication will be a record of the ground covered to date, with a review of some of the literature relative to the points considered.

From accurate models of normal and abnormal dentures, measurements by calipers were made and the senior author succeeding in transferring the positions of teeth on a model, to a plane, for study by means of bisecting lines.

Skulls of different races were also investigated by this means. Method: Fig. 1.

A line A-B was drawn. The calipers were placed in the buccal groove of the upper first molars on a line with the buccal cusps, and slight holes were made with the calipers. This width was marked on line A-B, at A^1 and B^1 (Fig. 1). Starting at the first molar on the left, the caliper point was placed in the hole and the other point on the summit of the buccal cusp of the second bicuspid. With this measurement an arc of a circle was made with the center at A^1, and each tooth on the model was similarly treated. Then starting with B^1 as a center these arcs were bisected with the measurements taken from the right first molar.

At this stage, this procedure was interesting in studying the arch form and especially in measuring the asymmetry of individual teeth by placing symmetrical figures around these points. See Fig. 2.

The Hawley arch was first used for this purpose. Fig. 3.

On this plan all arches are the same, *i. e.,* all circles in front have for a radius the combined width of the three front teeth, and the sides meet the line A-B at an angle of 70°, the only difference being that larger arches are selected for large teeth and small arches for small teeeh. Hence the assumption, that all dental arches are alike in form, varying only in size, due to the size of the teeth.

As the form of the lower arch is smaller than the form of the upper, it follows, if the Hawley plan is chosen, the assumption is made,

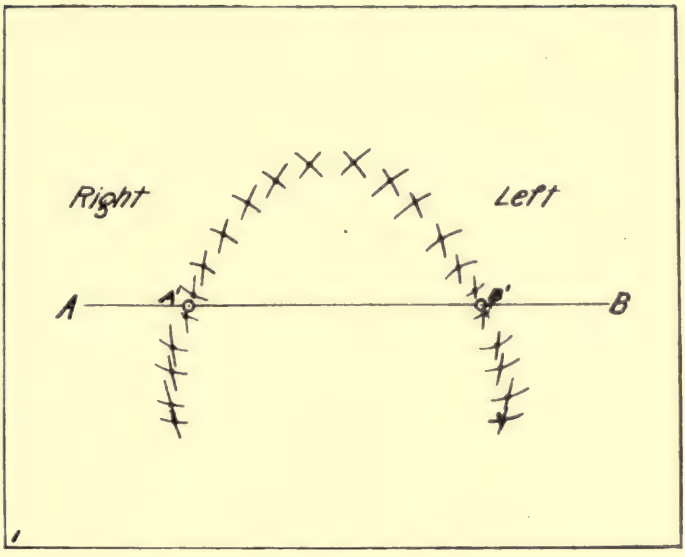

Right
Left
A
B
1

Fig. 1

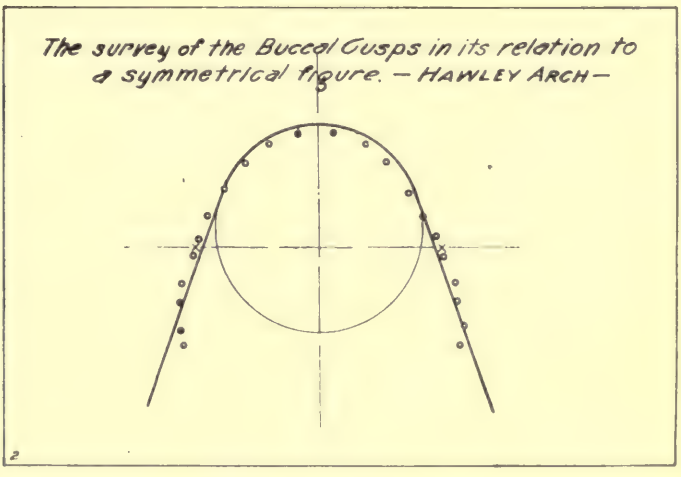

The survey of the Buccal Cusps in its relation to a symmetrical figure. — HAWLEY ARCH —
2

Fig. 2

that the lower teeth can be made to occlude by selecting a line for the lower that is equidistant from the upper arch form. This assumption I first found to be incorrect by the use of the calipers and bisecting lines in the study of the Wilks case. Fig. 4.

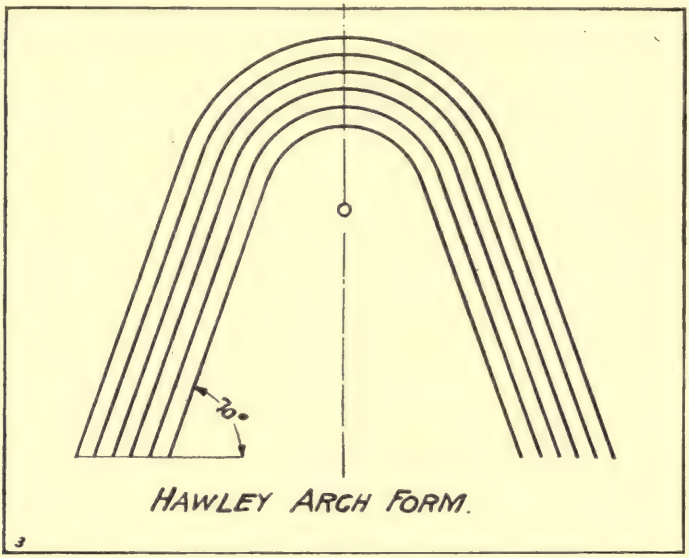


Fig. 3

Figure 4 shows the positions of the cusps and the incisal edge of the upper teeth and the corresponding points of the lower in their relations to each other, as determined by the bisecting line method. From this arch and other models was found the relation of the lines of the upper and lower teeth. In the molar region the lower buccal cusp line is approximately 3 mm. distant from the upper buccal cusp line, gradually approaching the outer curve until the median line is reached where the distance is approximately 1.50 mm.

After this deduction was made a modification of the Hawley plan was adopted, as follows:

An upper Hawley arch was selected which would take the tooth material of the upper arch. Fig. 5.

On the line A-B, points E, F, are located about 3 mm. from the line of the upper, H and I 2 mm., and point G 1 mm. (It is to be noted that the points H and I represent the summit of the buccal cusp of the lower P-M, hence the circle H-G-I, represents the lower four incisors, cuspids

and one-half of the lower first bicuspid, right and left, while the circle M-D-N, represents only the six anterior teeth of the upper.)

At this point the authors wish to express their appreciation of the work of Hawley and the great aid it was in this investigation, and the

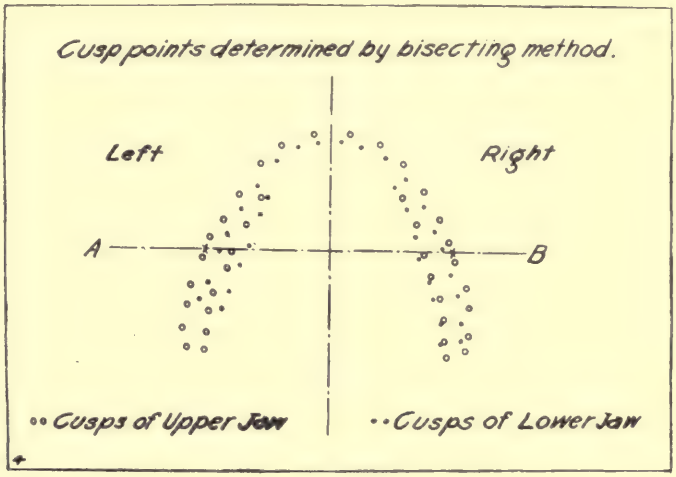


Fig. 4

credit to him for assuming the possibility of selecting the normal arch form in advance to which teeth in malocclusion may be moved.

Arch Form.

The following extracts will give an idea of some leading text books on the subject of arch form.

Kingsley.

(*Oral Deformities*, 1879.) "The normal type of the dental arch I conceive to be a regular line. The arch may be wider or narrower, varying somewhat in individuals or races, but the line will be an easy graceful curve without a break or tendency to form an angle."

Black.

(*Dental Anatomy*, 4th edition, 1902.) "The upper teeth are arranged in the form of a semi-ellipse, the long axis passing between the central incisors; occasionally the molars and bicuspids form a straight line instead of a curve and frequently the third molars are a little outside the line of the ellipse. In the examination of casts of the most perfect dentures, it is found that the two sides do not perfectly correspond, and that certain teeth deviate slightly from the perfect line. The incisors are arranged

with their cutting edges forming a continuous curved line from cuspid to cuspid, and this line is continued over the cusps of the cuspids and the buccal cusps of the bicuspids and molars to the distal surface of the third molars. From the first bicuspid to the third molar the lingual cusps of these teeth form a second line of elevations. Between these two, the

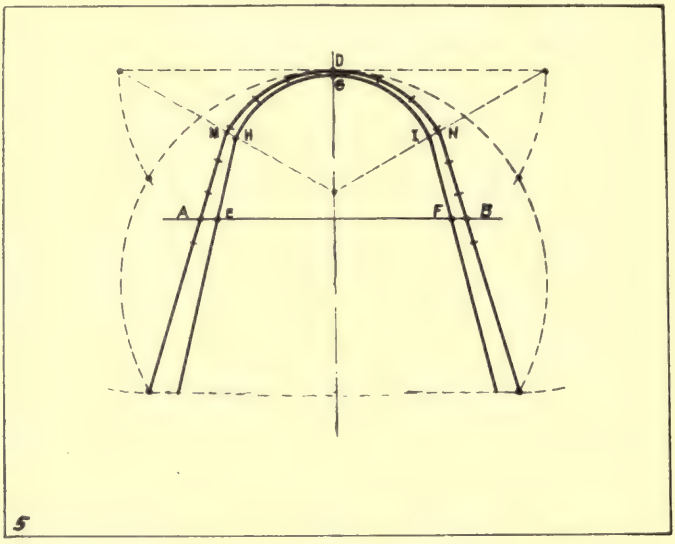


Fig. 5

lingual and buccal cusps, there is a continuous, but irregular valley or sulcus.

"The lower teeth are arranged similarly but on a slightly smaller curve, so that the line of the ellipse, which falls on the buccal cusps of the upper bicuspids and molars, will fall upon the buccal surfaces near the gum on the lower teeth. Therefore, in occlusion, the upper teeth project a little to the labial and buccal of the lower at all points of the arch. The incisors and cuspids occlude so that the cutting edges of the lower incisors and cusps of the cuspids make contact with the lingual surfaces of the similar teeth of the upper jaw and near the cutting edges. In this, however, there is much variety within the limits of a normal occlusion. Sometimes the lower incisors strike the lingual surfaces of the upper near the linguo-gingival ridge, and may strike at any point between that and the cutting edges.

"The line from before backward on which the occlusion occurs is

not quite a plane; in the lower jaw it presents a slight curve, or concavity, and in the upper jaw a convexity. This concavity of the line of the occlusal surfaces of the lower teeth is a little greater than the convexity of the upper, so that the cutting edges of the lower incisors pass a little beyond, and to the lingual of the cutting edges of the upper incisors."

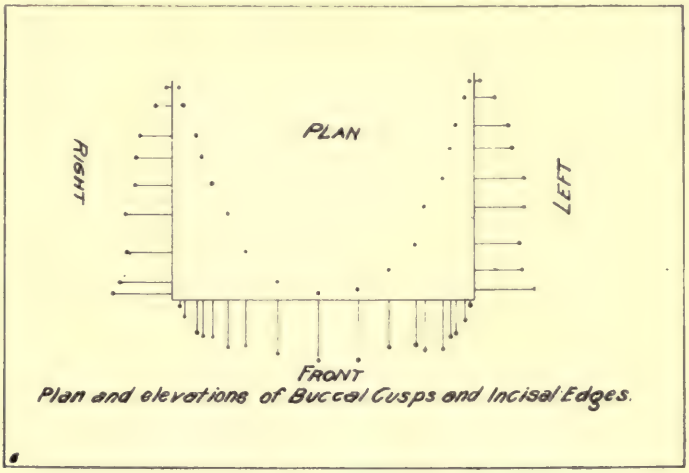


Fig. 6

Talbot. (*The Irregularities of the Teeth,* 1903.) "In the skull, in taking the two cuspids for the starting point, the arc of a circle is found. On dropping a line from the cusp of the cuspid to the wisdom tooth, the posterior part is seen to diverge considerably from the central line. If the articulated skull should be placed with the buccal surface toward the observer, a gentle curve downward will be seen from the cuspid to the second bicuspid rising there until the wisdom teeth are reached."

Tomes. (*Dental Anatomy,* 1904.) "The teeth of the upper jaw are arranged along a curve of larger dimensions than those of the lower."

Gysi. (*Dental Cosmos,* 1910, Page 280.) "The arches have the form of a parabolic curve. The incisors and canines of both arches form part of the arc of a circle. The arches viewed from the side show a curve from the front to the rear. The curve begins to go upward back of the first molors."

Ales Hrdlicka. (*Anthropologist at National Museum at Washington.*) In conversation Hrdlicka stated to the authors that the dental arches from the viewpoint of an anthropologist, were classified as elliptical and parabolical. The determination made by considering the direction of a line passing through the center of the first and second molars. If this line diverges from the

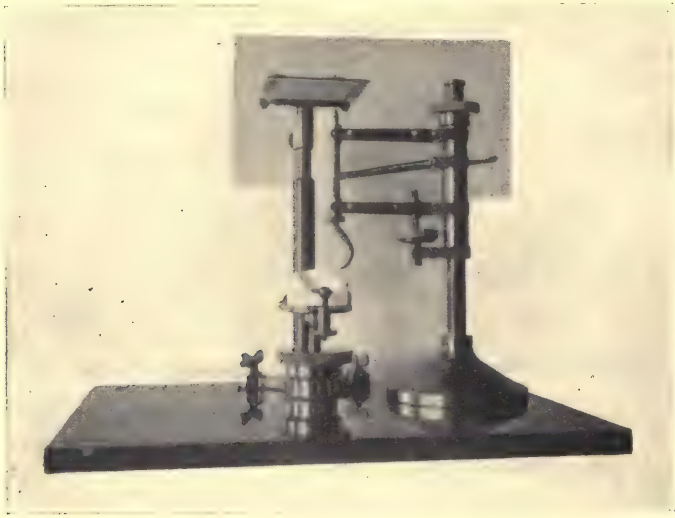
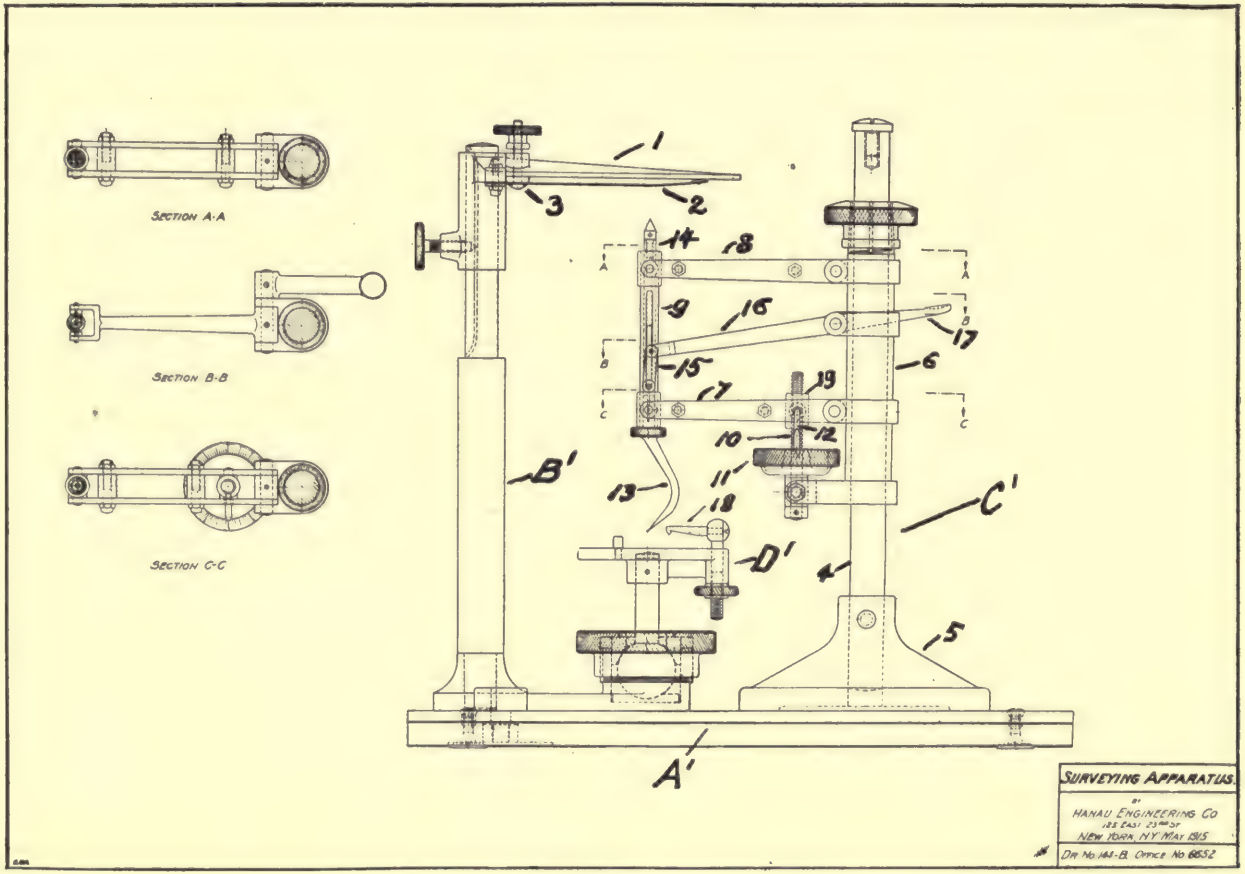


Fig. 7

median suture of the palate, the arch is considered parabolic, if converging, elliptical, and parallel accordingly.

Angle. (*Treatment of Malocclusion of Teeth,* 7th edition, 1907.) In the sixth edition Angle defines the line of occlusion: "The line of the greatest normal occlusal contact." Seventh edition: "The line with which, in form and position according to type, the teeth must be in harmony if in normal occlusion." "This line describes more or less of a parabolic curve, and varies within the limit of the normal according to race, type, temperament, etc., of the individual. It is difficult to determine exactly what the form of this line should be in each given case." "The malpositions of teeth consist principally in the variations of the positions of their crowns from the normal."

Angle, in deprecating the vagueness of descriptive terms of the teeth in malposition suggests the following: "A tooth outside the line of


SECTION A-A
SECTION B-B
SECTION C-C
A'
B'
C'
D'
1
2
3
4
5
6
7
8
9
10
11
12
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19
SURVEYING APPARATUS.
BY
HANAU ENGINEERING CO
125 EAST 23RD ST
NEW YORK, N.Y. MAY 1915
DR. No. 141-B. ORDER No. 6852

Fig. 8.

occlusion may be said to be in buccal or labial occlusion, when inside this line in lingual occlusion. If farther forward or mesial of the normal, in mesial occlusion, if turned on its axis, it would be in torso occlusion. Teeth not sufficiently elevated in their sockets would be in infra occlusion, and those that occupy positions of too great elevation, in supra occlusion."

To the student of Orthodontia these descriptions must be puzzling and unsatisfactory. In Angle's work, which is generally the accepted text book, one is told the line is more or less parabolic and difficult to determine. This same authority attempts to locate a malposed tooth in space, by describing the position of a tooth in its relation to a line, thus ignoring the accepted scientific method of determining the positions of bodies in space by means of geometry.

Having studied the above literature and also models and skulls by means of calipers and bisecting lines, I was more certain than ever of the necessity of recording and measuring the relative heights of the teeth, and afterwards to consider the dental apparatus in all three dimensions. To this end I consulted with the junior author (a mechanical engineer), with the result that the Dental Surveyor was produced.

The problem set was to devise a means of truly recording the positions of the teeth not only in one projection but also with consideration of their relative heights or elevations to a plane which shows the dental arch. The apparatus introduced solves this in the most simple manner, by directly projecting the points of interest to a horizontal plane, and simultaneously permitting the elevations of the points to be read. The data and measurements thus obtained enable one to produce elevations, giving the exact position of each point in space. Of particular interest are the right, left, and front elevations.

The central drawing of Fig. 6 gives all points surveyed in their horizontal projection. The right, front, and left elevations are also shown and marked accordingly. From the survey and the elevation may be read the position of each point and its relation to the others.

A photographic reproduction of the surveying apparatus is shown in Fig. 7.

On drawing, Fig. 8, the same apparatus is shown.

Description of Surveying Apparatus.

It consists of four main parts. The surveying table A^1 which represents the surveying plane, the stand B^1, carrying the holder for the paper on which the survey is recorded, C^1 is the surveyor proper, and D^1, the support for holding the model. The paper is held in the holder 1 by means of the springs 2, and bar 3, in such a position that it remains parallel with the surface of the table A^1.

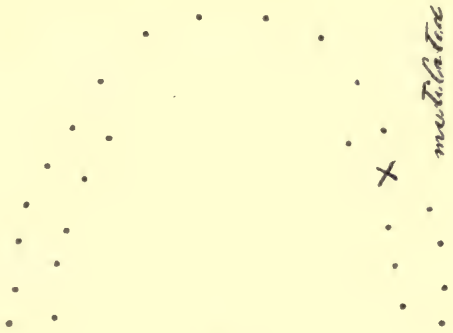


Fig. 9.

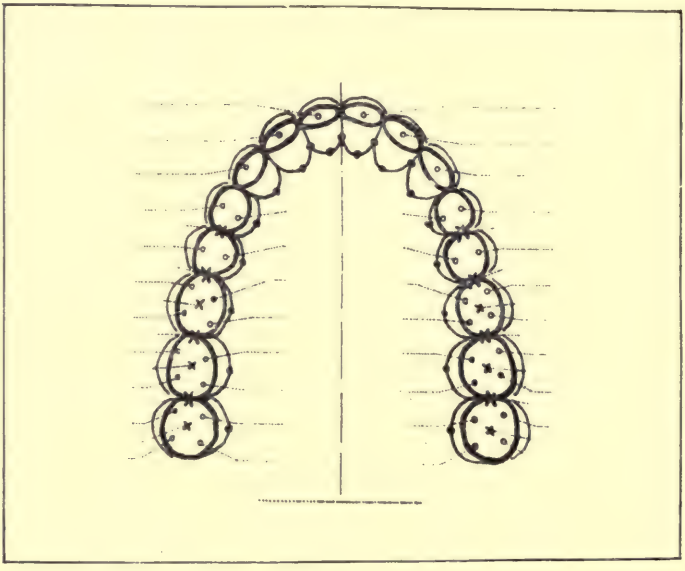


Fig. 10.

The surveyor C^1 is an independent part and can be brought into any position on the table A^1. It consists of a vertical shaft 4 in a base 5. The adjustable sleeve 6 on the shaft 4 carries two arms 7 and 8 on the ends of which there is fulcrumed the sleeve 9 in such a manner that the connecting lines of the four fulcra at the ends of arms 7 and 8 form a parallelogram. In 7 there is pivoted a tap sleeve 19. Thus lifting and lowering of the arms is made possible by means of screw 10 carrying a graduated wheel 11. The screw is suitably pivoted in the sleeve 6. The elevations are read on the graduations at a line provided for on hand 12. The sleeve 9 carries at its lower end a ball pointed extension 13. The shaft 14 pointed at its top slides in sleeve 9 and is operated by links 15 and lever 16 when the key 17 is pressed down. The point of shaft 14 and the ball end point of extension 13 are exactly on the axis of sleeve 9. On account of the parallelogram arrangement of the fulcra, it follows, that the axis of 9 cannot change its vertical position to the surveying plane. The support D^1 has a vise-like device 18 to hold the plaster cast in position and terminates at its lower end in a ball end socket allowing ample adjustment for the plaster cast.

To survey a point, the ball end of 13 is brought in contact with the point to be surveyed, then the key 17 is pressed down, throwing up the shaft 14. The shaft 14 thus operated is thrown with its point against the paper in the holder, leaving an imprint which is the record of the surveyed point. The elevation is then read on the graduation of wheel 11.

Thus series of points (cusps, contact points, fossæ, gum points, etc.) may be surveyed. In order to be able to distinguish the different series of points, the holder is so constructed that carbon paper of different colors may be used. Duplicates of a survey may readily be obtained by simply using a plurality of paper and carbon as is done on the typewriter.

Fig. 9 is the survey of the buccal cusps of an upper jaw.

Fig. 10 is the form used for recording the elevations read on the graduated wheel.

Although it is possible to read one hundreths of a mm. by means of interpolation there is no need of following up the elevations more accurately than in tenths of mm., a measurement sufficiently accurate for any drawing board investigation and no doubt more than accurate enough for orthodontic purposes.

Fig. 11 shows the survey of an upper denture including palate lines of equal elevation. To more clearly picture the denture surveyed we introduced Fig. 12 showing the teeth schematically outlined and the cusps of the bicuspids and molars connected by straight lines.

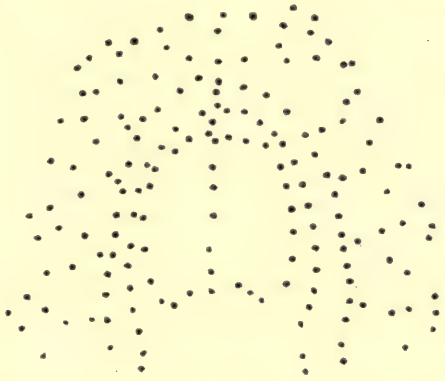


Fig. 11.

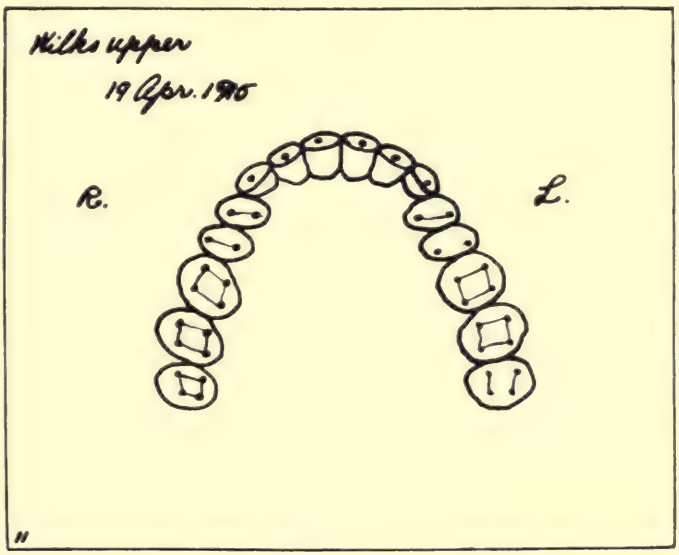


Fig. 12.

Horizontal Projection Described.

Fig. 13 shows the horizontal projection of the teeth in the upper denture.

The line A-B drawn through the buccal groove points, A^1 and B^1, is the buccal groove line. The distance of A^1 and B^1 is the width of the dental arch (W). The point between the central at the incisal edge is marked C^1. The perpendicular line thrown from C^1 on the line A-B, represents the height (H) of the dental arch. It is rather inconvenient if not impossible to measure the height (H) on the plaster cast, while the distance A^1 C^1 and B^1 C^1 may readily be measured by using a divider. The height line (H) intersects the buccal groove line A^1 B^1 at the point D^1. If D^1 is in the center between A^1 and B^1 then we have an even distribution of the tooth material, not necessarily a symmetrical arch form before us.

The horizontal projection of the arch form is symmetrical, if two corresponding teeth and parts thereof show the same distance from any two points on (H), which then becomes the symmetry line.

The plane perpendicular to the horizontal projection through C^1 D^1 may be called the sagittal plane.

The entire denture is symmetrical when two corresponding teeth and parts thereof have the same distance from three points, not on a line, selected on the sagittal plane. The plane referred to as the horizontal plane is determined by the following three points. C^1, the contact of the central incisal edges, and E^1 and F^1, the contact points of the right and left second bicuspids with the corresponding first molars. The advantage of selecting a plane through these three points will be explained later on. To enable us to locate the position of any point in space it will be necessary to assume the third plane. One perpendicular to the horizontal plane and through the buccal groove line will fully answer the purpose. This plane may be known as the buccal groove plane. All three planes so selected are necessarily perpendicular to each other and they therefore bisect in three perpendicular lines, having a common intersection at D^1.

Our investigations have shown that there exist six distinct curves in space on which the cuspal points and sulci may be found.

Lines Designated.

In making allowances for the small irregularities which may be observed in teeth, it was found that mathematical curves exist which very nearly coincide with the broken line which may be drawn from cusp to cusp, etc., in dentures showing correct occlusion.

The suggestion of Dr. Murlless of naming these curves with letters has been adopted and the following ones have been decided on.

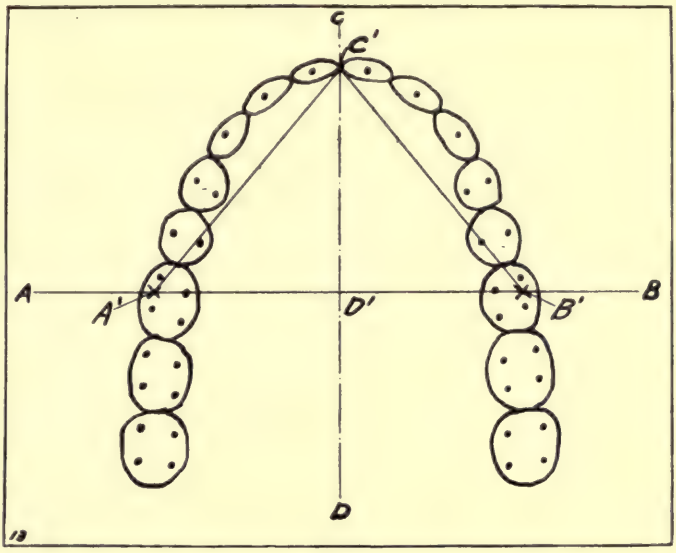

C
C'
A
A'
D'
B'
B
D
13

Fig. 13.

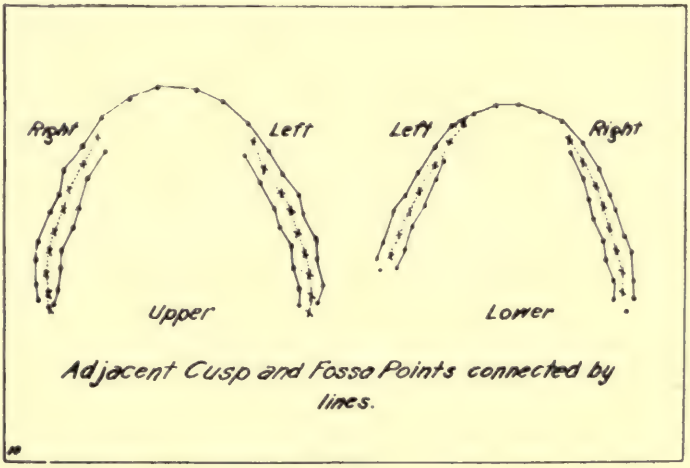

Right
Left
Upper
Left
Right
Lower
Adjacent Cusp and Fossa Points connected by lines.

Fig. 14.

Upper Jaw.	Lower Jaw.
A equals buccal cusp line.	b equals buccal cusp line.
B " fossæ line.	c— " fossæ line.
C " lingual cusp line.	d " lingual cusp line.

These curves in their horizontal projection are shown in their relation in Fig. 14.

It will be noticed that B and b coincide, also C and c. This is one *conditio sine qua non* of proper occlusion, and probably the most important for selecting the proper arch form of a denture in malocclusion.

In Fig. 15 is shown the relation of the different curves to each other.

It will be found that in an elliptical arch form (more accurately described later on) the interrelation of the curves are as follows:

Distance between the buccal and lingual cusps upper=X

Distance between the buccal and lingual cusps lower=Y

Conjugate Axis.	Transverse Axis.
A to B=½ X=A to b	A to B=¼ X
B to C=½ X= b to c	B to C=¼ X
C to d=$(Y - \frac{X}{2})$= c to d	C to d=$(\frac{Y}{2} - \frac{X}{4})$

Example: When the buccal and lingual cusps of the upper molars are distant 6 mm. and the lower 5 mm.

A to B=3 mm.	A to B=1½ mm.
B to C=3 mm.	B to C=1½ mm.
C to d=$5 - \frac{6}{2} = 2$	C to d=1 mm.

In measuring the distances, buccal to lingual cusps of each tooth, it will be found that this distance increases from the bicuspids to the molars, although the third molar cusp distance very often shows a slight decrease. The increase in the cusp distance will not be noticed very much in the horizontal survey. In fact a slight decrease in the cusp distances will be noticed from the second molar backwards. This is partially due to the increased inclination of the tooth crown to the projecting plane.

The cusps of the bicuspids and molars more especially of the upper denture may be described as being located on a bent propeller-blade surface. This generally accounts for the fact that with the exception of two cusps they do not appear in their true distance in the horizontal survey. The two cusps that will appear in correct distance in the horizontal survey, will generally be the buccal and lingual cusps of a bicuspid where the pitch of the blade becomes negative.

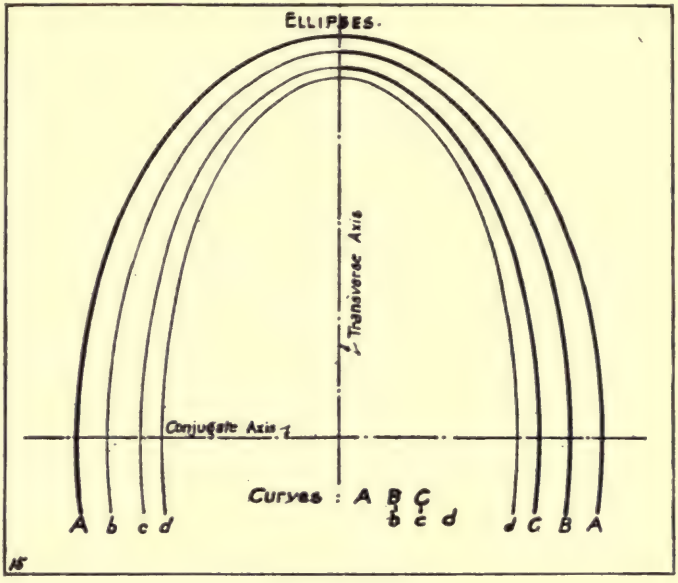

ELLIPSES.
Transverse Axis
Conjugate Axis
Curves : A B C
b c d
d C B A
A b c d
15

Fig. 15.

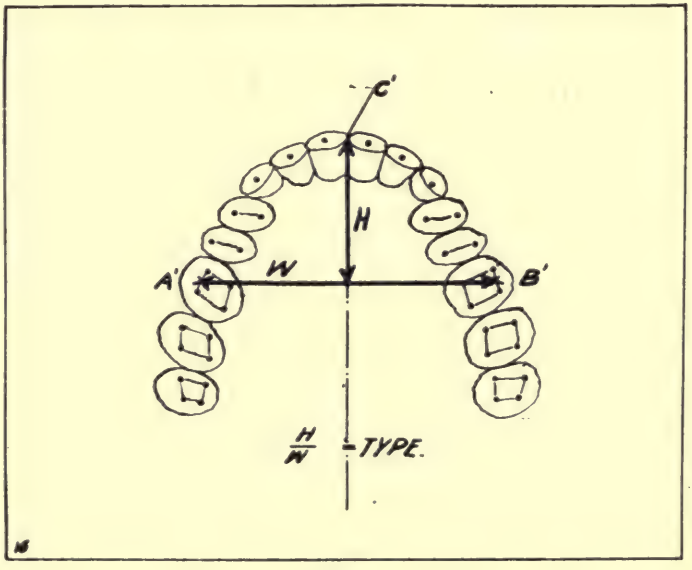

C'
H
W
A'
B'
H/W = TYPE.
16

Fig. 16.

The width (W) of the dental arch (Fig. 16) is the distance between the buccal grooves of the first permanent molars of the upper jaw. The points A^1 and B^1 used for measuring, are on the buccal groove between and in line with the summits of the buccal cusps. The height (H) of the arch is measured from a point C^1, between the centrals at the incisal edge to the width line, which will be called the buccal groove line.

Example: The ratio $\frac{H}{W}$ is the type of a dental arch.

Arch form is the curve projected from the summits of the buccal cusps and the incisal edge of the upper denture to the surveying plane.

A curve is a line continually changing its direction. The character of a small part on a curve may be indicated by giving the change in direction, which is equivalent to the change of the angles of the tangents.

If the change is gradual and constant then the curve is a circle.

Here we will only deal with such curves which represent mathematical or geometrical functions and select those for our purpose, parts of which show a character observed in the arrangement of the normal human denture where occlusion is apparent.

Arch Forms.

The dental arch forms most frequently met have the character of ellipses and parabolas, or rather of arcs thereof.

Arch forms showing the character of arcs found on the lemniscate, egg-shaped curve, the heart curve, cissoid, cubic parabola, etc., may also be observed.

Dr. A. H. Thompson who has made extensive observations of arch forms, classifies four different main types of dental arches. The square, rounded square, rounded and rounded V-arch form.

It is to be regretted, that when such arbitrary figures were chosen, that Dr. Thompson did not indicate the construction and their application to arch form.

The arch form which he classifies as square, probably does not generally exist in proper occlusion. The reason for making such deductions is probably the optical illusion, to be observed in dentures.

In most cases it is almost impossible to recognize the true relation of the cusps in the denture where there is an irregularity in the relation of cusps to even the visible parts of tooth body.

A similar observation may be made by looking at the upper and lower models of a denture, where perfect occlusion exists. The buccal cusps of the lower denture seems to appear on a more parabolic curve than the sulci points of the upper denture. This optical illusion is due

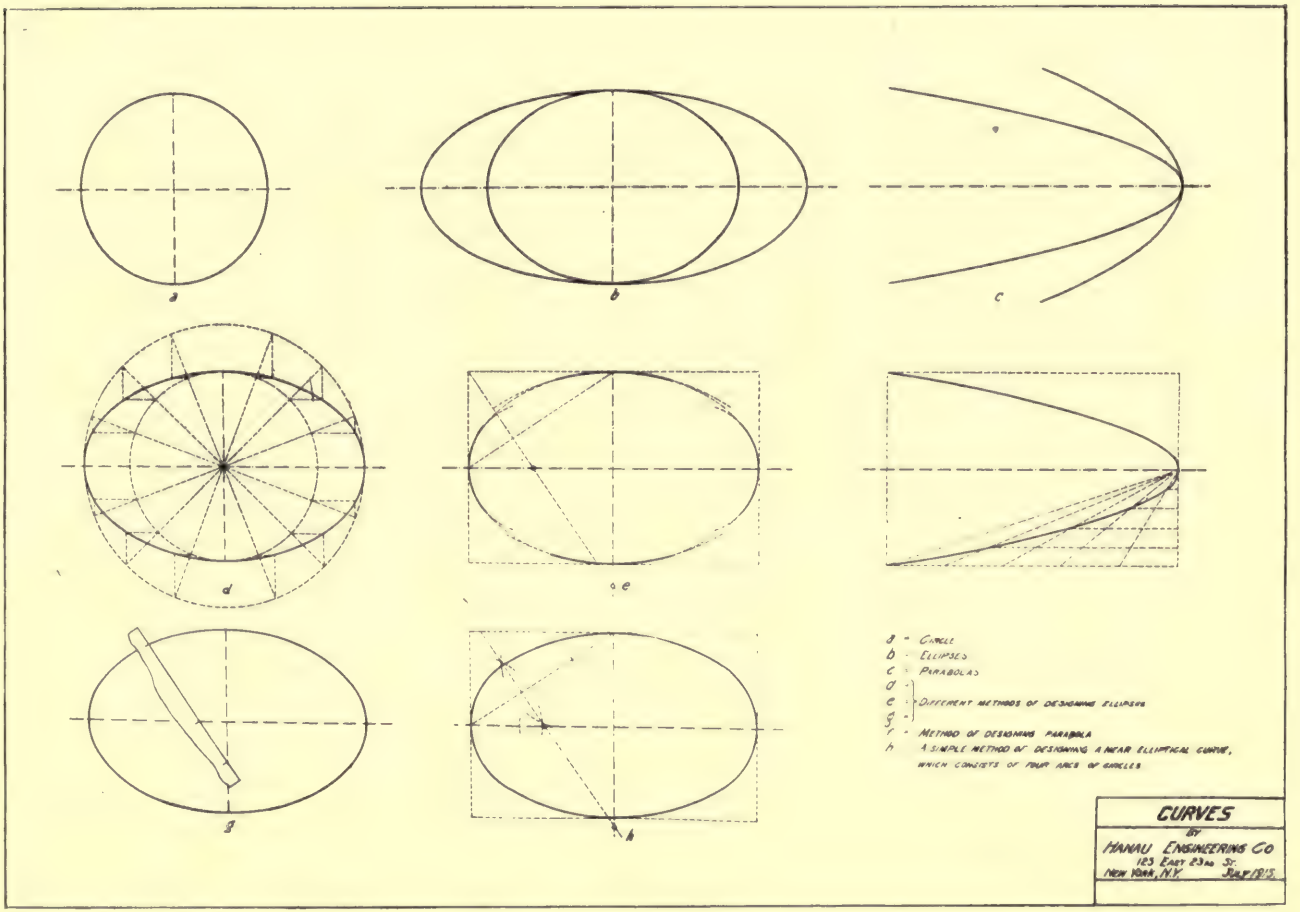

a
b
c
d
e
g
h
a = CIRCLE
b = ELLIPSES
c = PARABOLAS
d
e = DIFFERENT METHODS OF DESIGNING ELLIPSES
g
f = METHOD OF DESIGNING PARABOLA
h = A SIMPLE METHOD OF DESIGNING A NEAR ELLIPTICAL CURVE, WHICH CONSISTS OF FOUR ARCS OF CIRCLES
CURVES
BY
HANAU ENGINEERING CO
123 EAST 23RD ST.
NEW YORK, N.Y.
JULY 1915

Fig. 17.

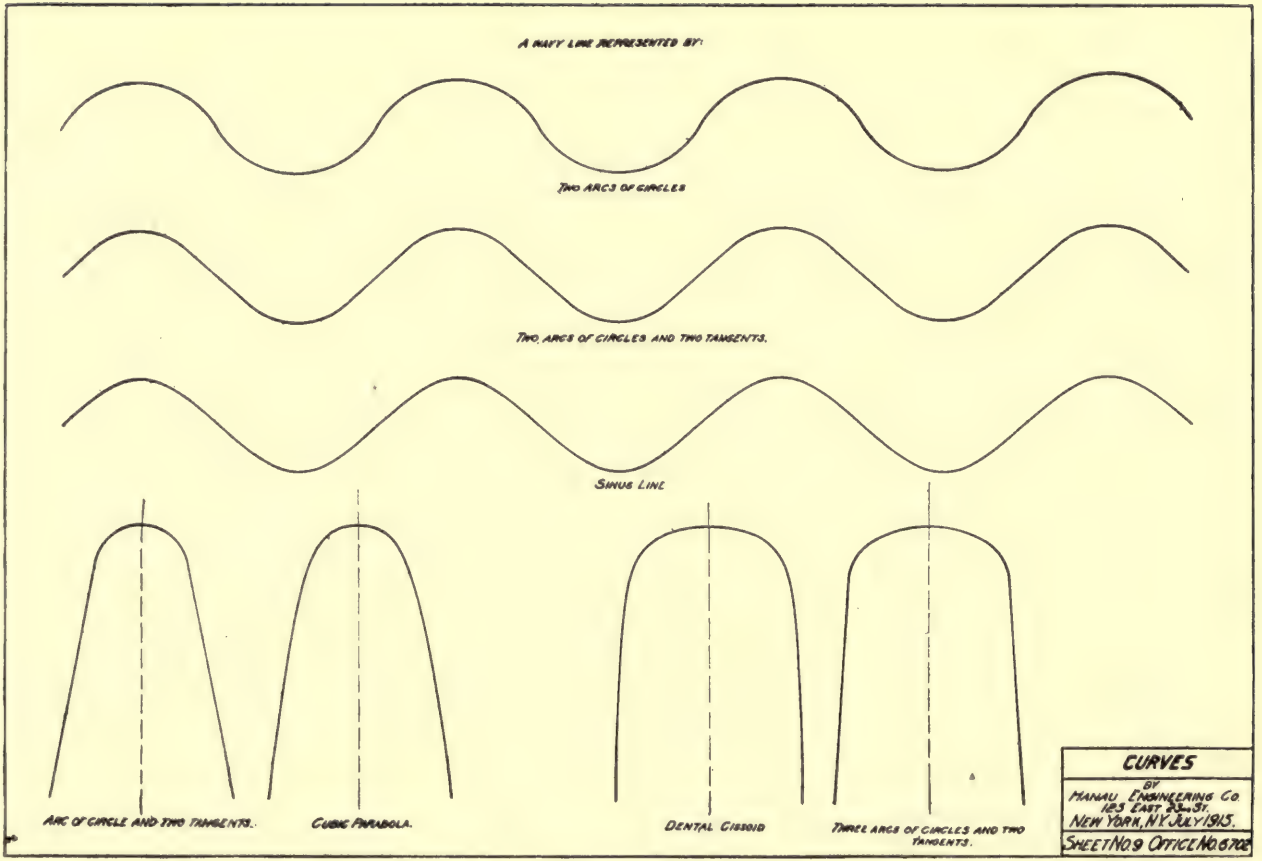

A WAVY LINE REPRESENTED BY:
TWO ARCS OF CIRCLES
TWO ARCS OF CIRCLES AND TWO TANGENTS.
SINUS LINE
ARC OF CIRCLE AND TWO TANGENTS.
CUBIC PARABOLA.
DENTAL CISSOID
THREE ARCS OF CIRCLES AND TWO TANGENTS.
CURVES
BY
MANAU ENGINEERING CO.
125 EAST 23rd ST.
NEW YORK, N.Y. JULY 1915.
SHEET NO 9 OFFICE NO 6702

Fig. 18

to the fact that the points referred to in the lower denture are on a concavity, while those of the upper, are on a convexity.

Dr. C. A. Hawley in his paper read before the New York Institute of Stomatology, April 4, 1906, correctly points out that bringing into orthodontia a mathematically and geometrically calculated plan, could not restrict or eliminate the feature of artistic judgment.

This is true when the arch form selected represents one continuous mathematical or geometrical function but the artistic effect will be mostly disturbed when patching together different or even like geometrical curves without regard to their character at the points of joining. In fact the joining of curves without consideration of their character may result in figures very offensive to artistically trained eyes. For this reason alone it will be difficult to produce an artistic effect in arranging the teeth along the Hawley arch, which in reality consists of three geometrical or mathematical curves, the arc of a circle and two straight lines.

To illustrate this contention, at the top is a line made by joining two arcs for each wave. Second line, by joining two arcs and two straight lines. (Fig. 18.)

These two figures simulate the true wave line shown in the third line, which is a true continuous curve—the sinus line.

At left we have arc of circle and two tangent straight lines simulating the cubic parabola.

At the right three arcs of circles and two straight lines simulating the dental cissoid.

The ellipse is a geometrical figure produced by the section of a cone by a plane passing obliquely through the opposite sides.

The conic section is a (common) parabola when the sectioning plane becomes parallel to one side of the cone.

The ellipse has two main axes (the transverse, long diameter), the conjugate (short diameter). These are perpendicular to each other and they are also the maximum and minimum diameter of the ellipse. The short diameter meets the ellipse at the two points where the maximum radius of the curvature will be found, while the long diameter at its end touches the ellipse where the minimum radius of curvature exist. From the point of minimum to that of maximum radius of curvature there occurs a gradual and continual increase of the radii and vice versa. The ellipse is a closed curve such as the circle, while the common parabola is an open curve. Mathematically it may be considered an ellipse with its axes bisecting in infinitum. Following the course of the parabola it will be found that from the sectioning point of the axis the radii increase gradually, and at the same time more rapidly than those of an ellipse showing the same minimum radius of curvature.

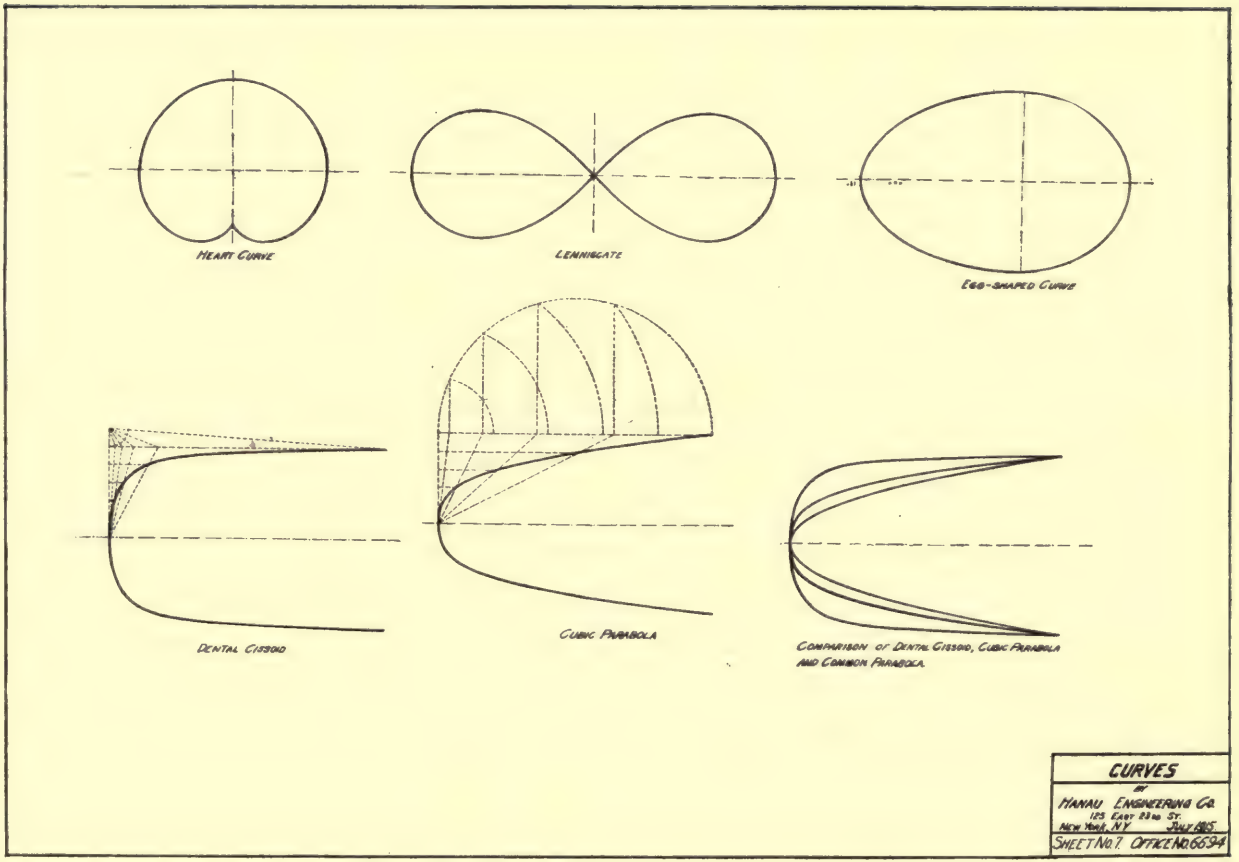

HEART CURVE
LEMNISCATE
EGG-SHAPED CURVE
DENTAL CISSOID
CUBIC PARABOLA
COMPARISON OF DENTAL CISSOID, CUBIC PARABOLA AND COMMON PARABOLA.
CURVES
OF
MANAU ENGINEERING CO.
125 EAST 23RD ST.
NEW YORK, N.Y.
JULY 1915
SHEET No. 7. OFFICE No. 6694

Fig. 19

Dr. F.L. Stanton.
Hanau Engineering Co
125 East 23rd St.
New York, N.Y. April 25
Survey No. 2. Dr. No. 6801-1
Front Elevation
Left
Right
Millimeter
Vertical Upper Limit
Lateral Upper Limit
Mean Line
Vertical Lower Limit
Lateral Lower Limit
Mean Line
Upper Jaw
Lower Jaw

Fig. 30

The blunt parabolical arch form is represented by the cubic parabola and kindred curves. While all the curves so far mentioned show a gradual increase of the radii of curvature and then a gradual but speedy increase of radii while following the curve; the minimum radius in the denture may be found in the cuspid region.

For certain types, blunt in front and of a parabolic character in the bicuspid and molar region, it has been necessary to seek a curve of such character. Although the cubic parabola to a certain degree is adaptable for this purpose, we offer the curve shown in Fig. 19 to be known as the dental cissoid, the construction of which is shown.

We therefore classify dental arch form as follows:

Elliptical Arch Forms. { Blunt. / Sharp.

Parabolic Arch Forms. { Blunt. / Sharp.

We may consider all those dentures of blunt elliptical form, if the arcs of the ellipse bisect on or in front of the second molar buccal groove line. Those having their axes bisecting in the back of the second molar buccal groove line, but still within the dental apparatus, may be classified under sharp elliptical arch forms. In case the axis of the ellipsis falls in back of the dental apparatus, then let us consider such arch forms as of parabolic character.

With increasing length of the transverse axis of an ellipse, the character of an ellipse very soon approaches that of a parabola.

In Fig. 20 we projected to a horizontal plane with the teeth in occlusion, the following points of the teeth.

Upper Jaw. {
- Outer gum points, midway between the mesial and distal cusps.
- Buccal cusp and incisal points, center of incisal edge.
- Fossæ points or sulcæ.
- Lingual cusp points.
- Lingual gum points, midway between the mesial and distal cusps.

Lower Jaw. { Same as upper.

By connecting adjacent points we will have broken lines that approximate the curves previously described as, A, B, C.

b, c, d.

B coincides with b.
C " " c.

In Survey 2, drawing 6611-1 (Fig. 20) it will be seen A almost coin-

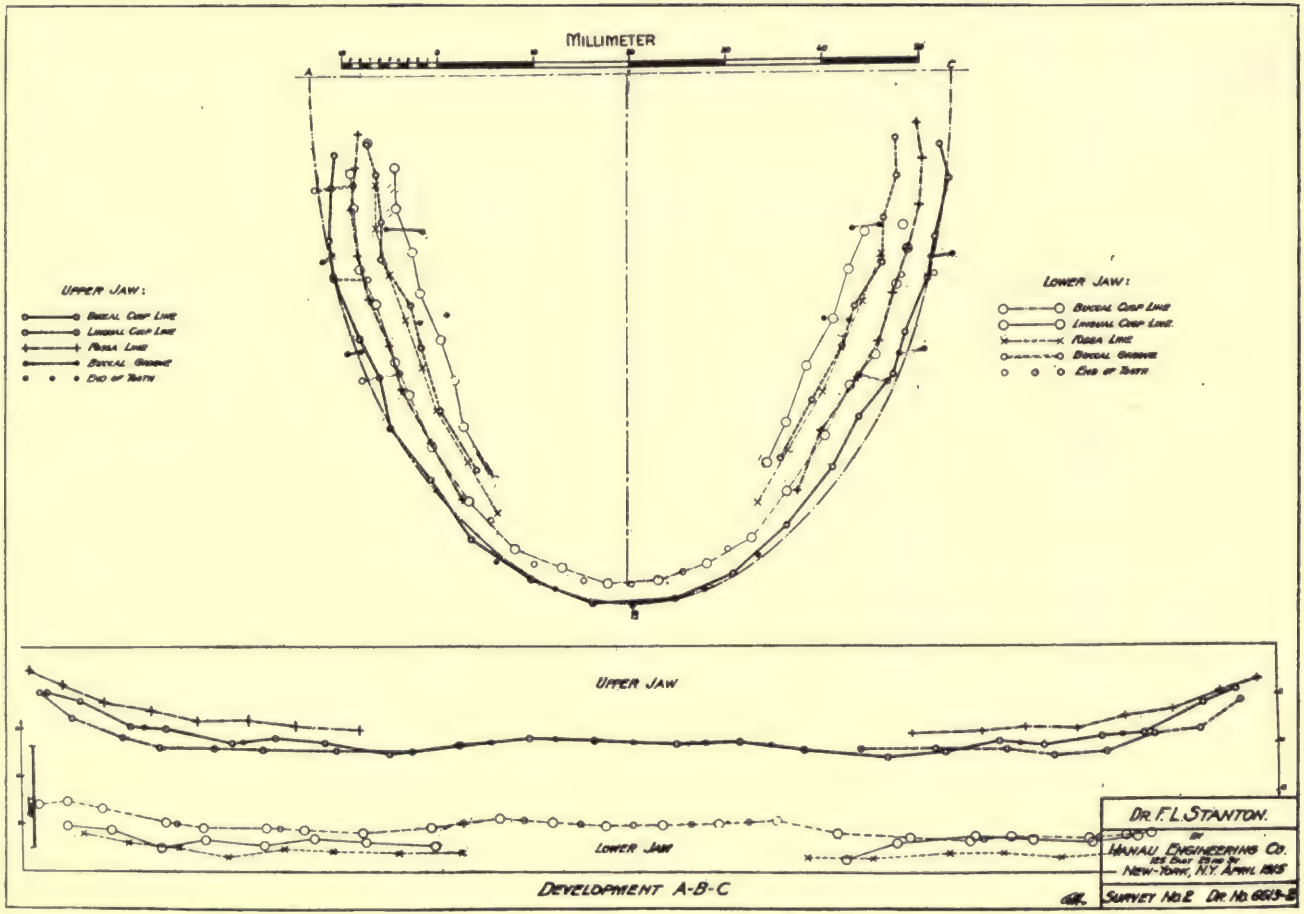

MILLIMETER
UPPER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
RUGA LINE
BUCCAL GROOVE
END OF TEETH
LOWER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
RUGA LINE
BUCCAL GROOVE
END OF TEETH
UPPER JAW
LOWER JAW
DEVELOPMENT A-B-C
DR. F. L. STANTON.
BY
HANAU ENGINEERING CO.
SURVEY NO. 2 DR. NO. 6619-B

Fig. 21

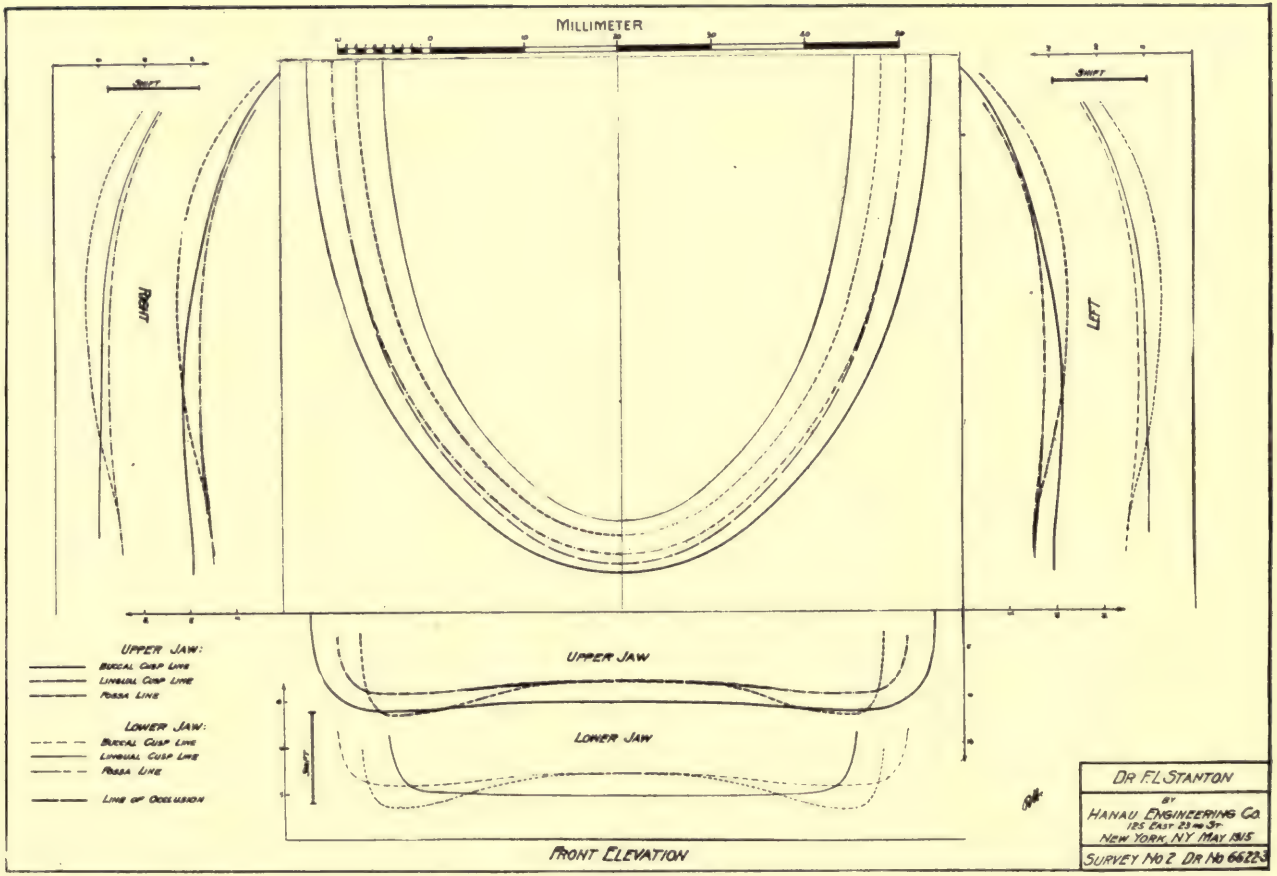

MILLIMETER
SHIFT
RIGHT
SHIFT
LEFT
UPPER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
LOWER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
LINE OF OCCLUSION
UPPER JAW
LOWER JAW
SHIFT
FRONT ELEVATION
DR F.L. STANTON
BY
HANAU ENGINEERING CO.
125 EAST 23RD ST.
NEW YORK, N.Y. MAY 1915
SURVEY NO 2 DR NO 66223

Fig. 22

cides with the buccal gum line of the lower and d with the lingual line of the upper, the slight deviation being due to the different inclinations of the teeth. In the same drawing the right and left side elevations are shown at the right and left side and front elevation at the bottom. In order to prevent confusion in the elevation of the points projected of the upper and lower jaw, the points of the lower jaw have been brought apart by a shift as indicated by the shift line in the drawing. (Note use of compass.)

A continuous curve cannot be drawn exactly through the surveyed points of each line, A, B, C,

b, c, d.

The succession of these points so nearly approaches the course of a continuous curve that one may be substituted. 6613-2. Fig. 21.

In the study of this case of nearly normal occlusion, it has been found that the ellipses selected most nearly conform to survey all points have the following characters: 6622-3. Fig. 22.

Ellipse A follows outer cusp points and incisal edge.

Ellipse B is on the fossæ points and is distant on the conjugate axis one-half of the distance between the outer and inner cusps of the upper molars.

Ellipse C is distant from A the width between the outer and inner cusps of the upper molars.

d is distant from B the width between the buccal and lingual cusps of the lower molars.

On the transverse axis B is distant from A ¼ of the distance between the outer and inner cusps of the upper molars.

C is also ¼ from B.

d is from B ½ distance of the cusps of the lower molars.

In the upper jaw the contact points (where we measure the tooth material) are approximately on a plane from the central to the bicuspid region and from there on the contact points are located on a curve steadily increasing its elevation above the plane of the contact points of the front teeth. Therefore it is obvious that any attempt will be unsuccessful to select two curves on a plane to lay out the normal tooth material of both jaws that will fulfill the requirements of occlusion. Exception being in those cases in which the contact points of the upper jaw assume approximately a plane. The contact points of the lower teeth have not been found on a plane and for quite apparent reasons will never be found on a plane where occlusion exists.

In measuring normal skulls it was found in the number measured that the width of the dental arch at the buccal groove line of the upper

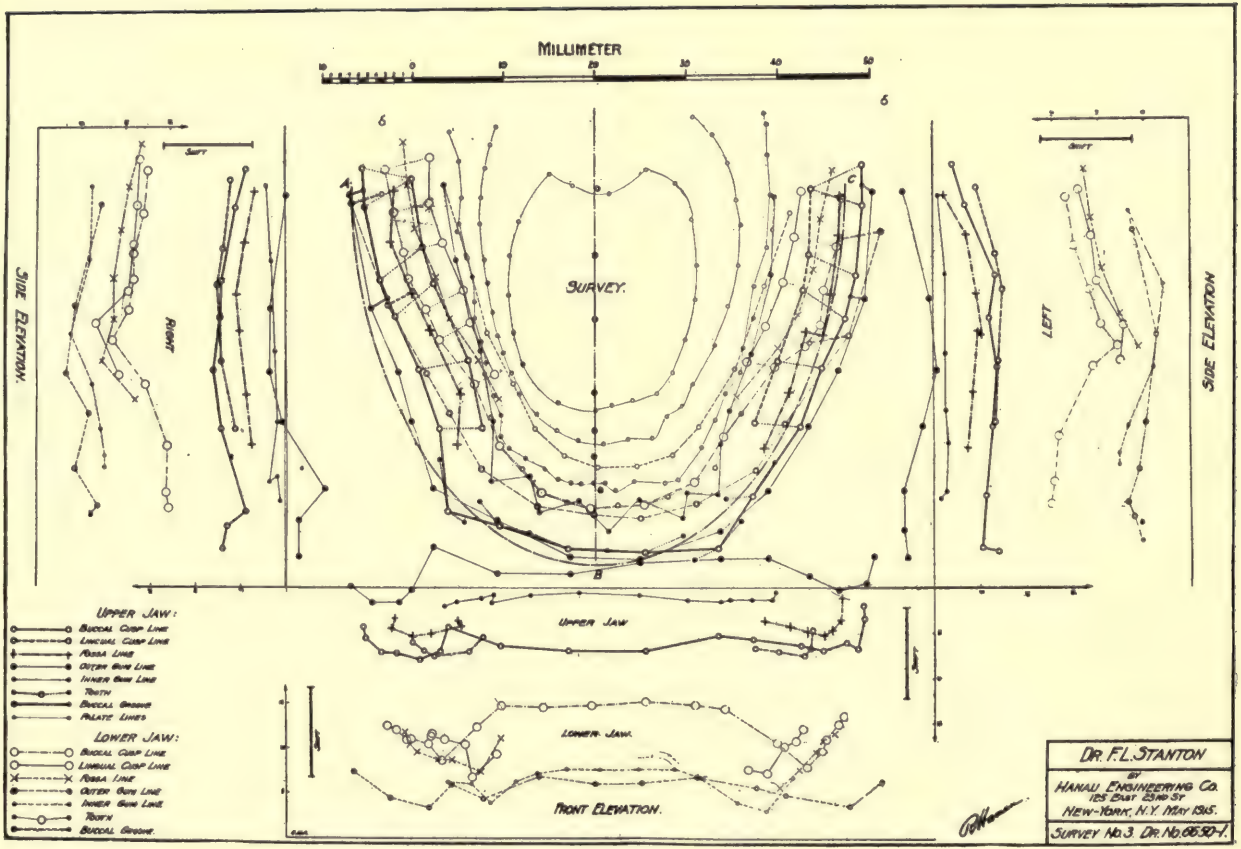
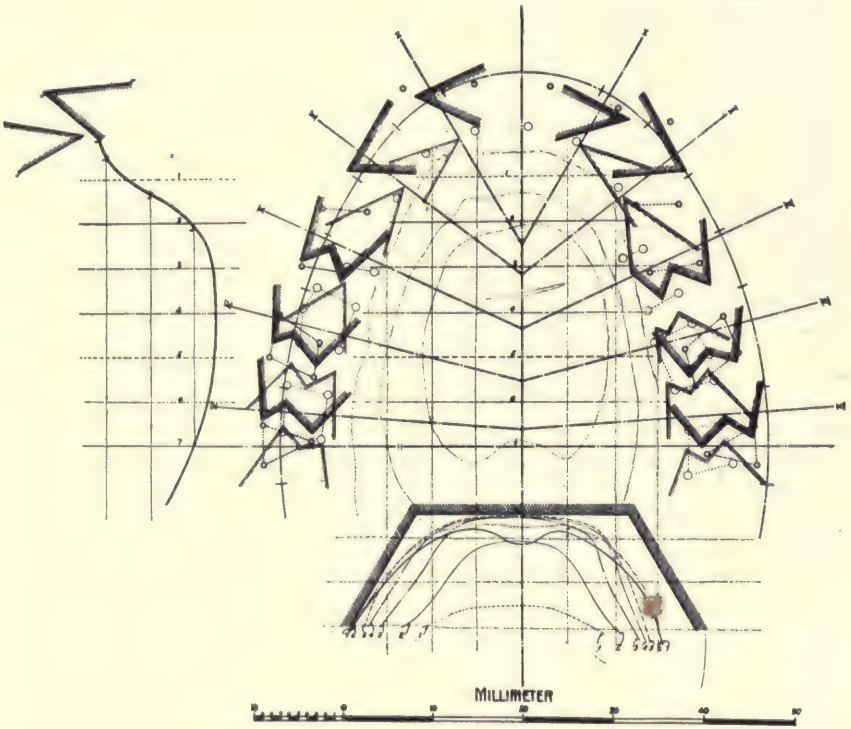

MILLIMETER
SURVEY.
SIDE ELEVATION.
RIGHT
LEFT
SIDE ELEVATION
UPPER JAW
LOWER JAW
FRONT ELEVATION.
UPPER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
ROSA LINE
OUTER GUM LINE
INNER GUM LINE
TOOTH
BUCCAL GROOVE
PALATE LINES
LOWER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
ROSA LINE
OUTER GUM LINE
INNER GUM LINE
TOOTH
BUCCAL GROOVE
DR. F. L. STANTON
BY
HANAU ENGINEERING CO.
105 EAST 25TH ST.
NEW-YORK, N.Y. MAY 1915.
SURVEY No. 3. DR. No. 6650-1.

Fig. 23



SECTIONS SHOWING MALOCCLUSION OF TEETH & UNSYMMETRIC FORMATION OF PALATE.

DR. F. L. STANTON.
BY
HANAU ENGINEERING CO.
125 EAST 23rd ST.
NEW-YORK, N.Y. MAY 1915.
SURVEY No. 3. DR No 6651-2

Fig. 24

first molar, the variation was from 52 to 62 mm., while the height of the same arches varied from 21 to 34 mm. The variation is much greater in the height than in the width of the arches. In other words (if these ranges of variation hold true) we are limited to a range of 5 mm. in placing a molar tooth bucco-lingually, while we have a range of 13 mm. in placing a central incisor edge.

At the stage of my work where I was measuring the asymmetry of arches by calipers and using the Hawley arch, I consulted Franz Boaz, the anthropologist at Columbia. Immediately he said, "your assumed figure is incorrect, you would move the teeth much farther than is necessary to produce occlusion. In your treatment you should find the curve that with the least tooth movement will produce occlusion."

Ales Hrdlicka, director of anthropology at the National Museum at Washington, also told me that we were using the wrong figure and aided me with suggestions and help.

While this communication is intended solely to bring to your notice a dental surveying instrument that will survey and record on a plane various points of the teeth, gums and palate and by recording heights permit projections being made, we cannot refrain from pointing out what we have discovered in studying normal and abnormal dentures, with suggestions to orthodontists that will enable them to select curves that with the least tooth movement will produce occlusion.

Description of Weed Case. *Points Surveyed.*

- Gum points, outer and inner.
- Buccal and lingual cusps and incisal edges.
- Sulci.
- 3 palate lines of different elevations.
- Palate suture.
- Contact points.

These points save palate, sulci and contact points are shown in right, front and left elevations. Different series of points are connected by lines, key at left. (Drawing 6650-1.) (Fig. 23) (Drawing 6651-2) (Fig. 24), section in broken lines vertical to the horizontal plane are introduced, marked by Roman figure. These sections are rotated 90° so that they may appear in the drawing on a horizontal plane. Straight lines connect outer gum point to the buccal cusp point, to the fossæ point, to the lingual cusp, to the inner gum point, thus schematically representing a section through the denture at the line shown. These lines show the upper and lower teeth in their occlusal relations. (Drawing 6651-2.) Fig. 24.)

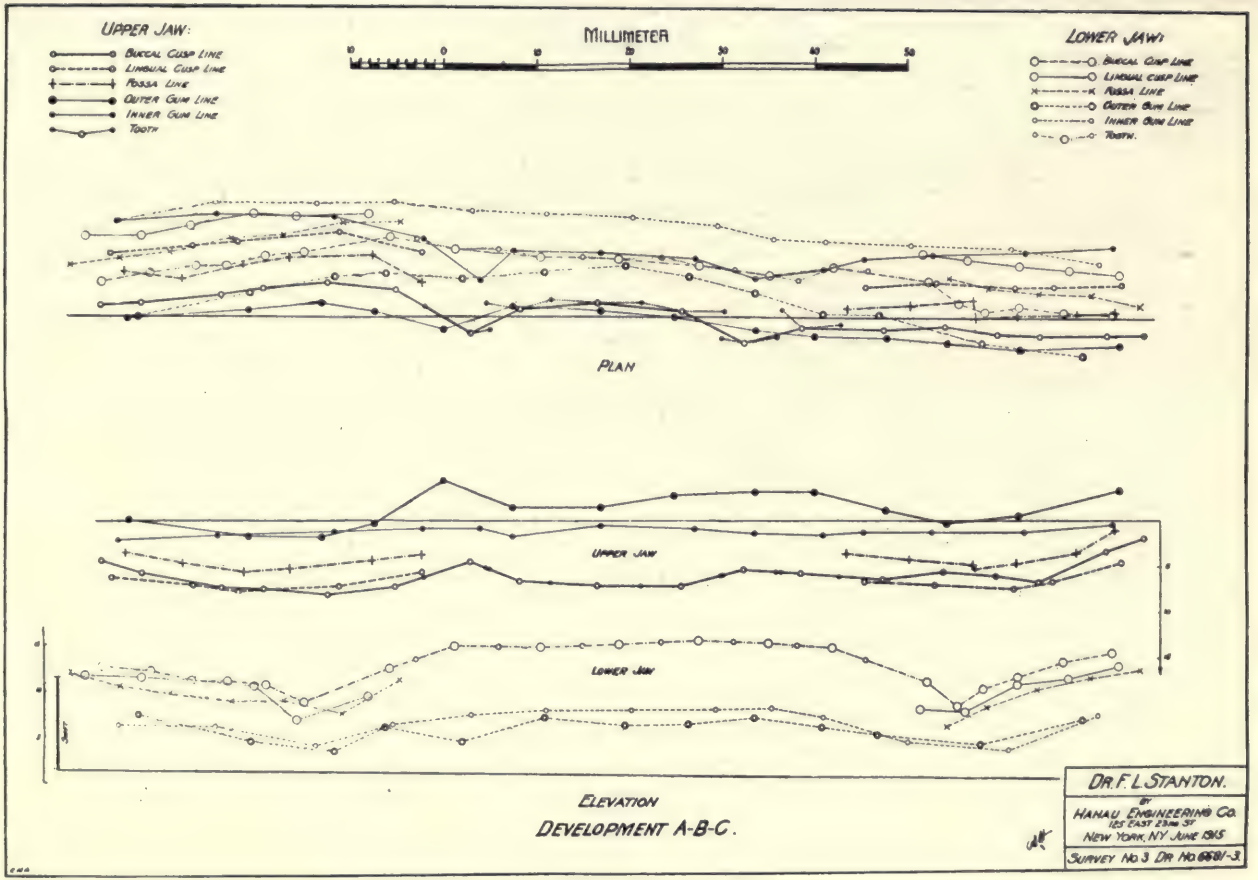

UPPER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
OUTER GUM LINE
INNER GUM LINE
TOOTH
MILLIMETER
10 0 10 20 30 40 50
LOWER JAW:
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
OUTER GUM LINE
INNER GUM LINE
TOOTH.
PLAN
UPPER JAW
LOWER JAW
ELEVATION
DEVELOPMENT A-B-C.
DR. F. L. STANTON.
BY
HANAU ENGINEERING CO.
125 EAST 23rd ST
NEW YORK, N.Y. JUNE 1915
SURVEY NO. 3 DR. NO. 6681-3

Fig. 25

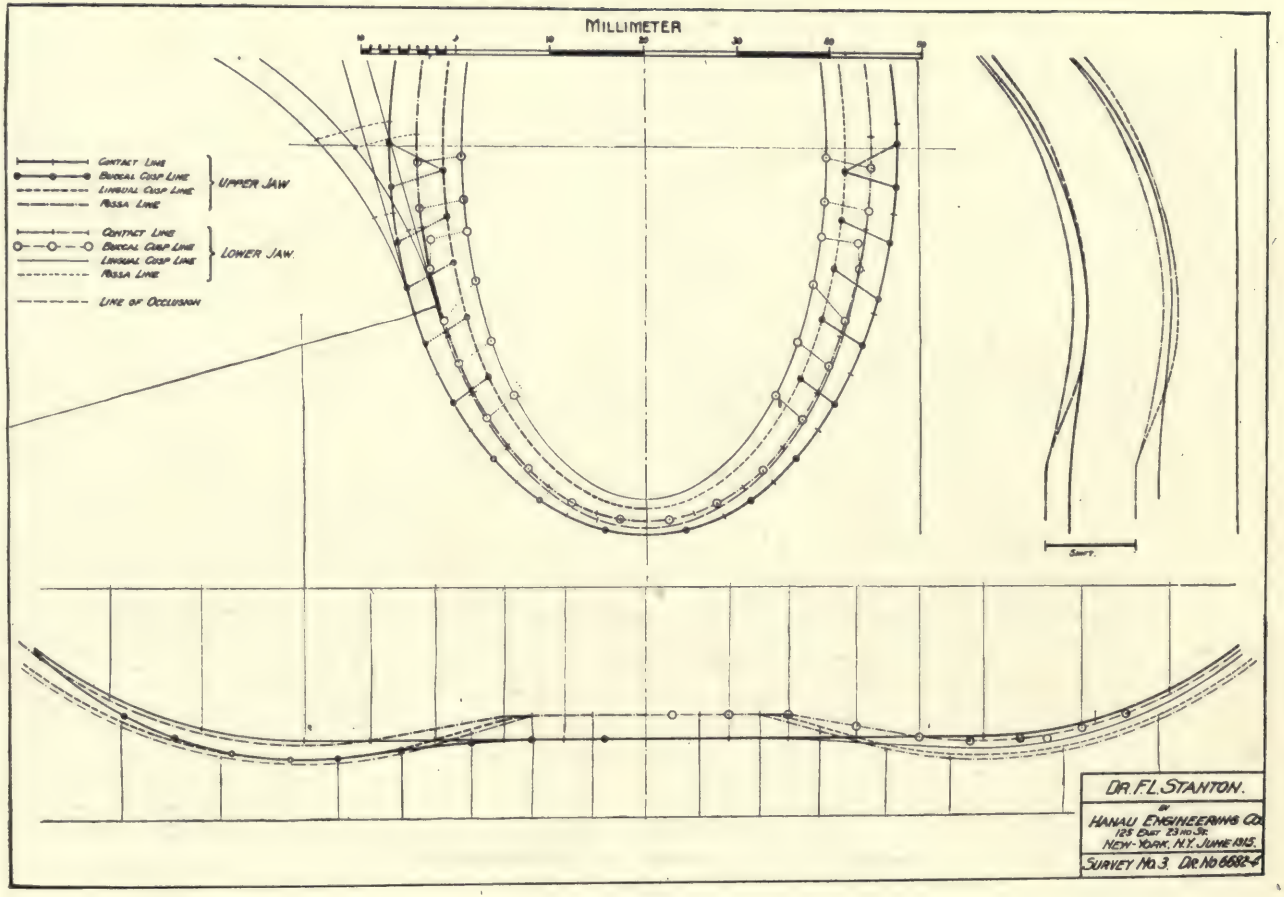

MILLIMETER
CONTACT LINE
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
UPPER JAW
CONTACT LINE
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
LOWER JAW.
LINE OF OCCLUSION
DR. F.L. STANTON.
BY
HANAU ENGINEERING CO.
125 EAST 23RD ST.
NEW-YORK, N.Y. JUNE 1915.
SURVEY No. 3. DR. No 6682-4

Fig. 26.

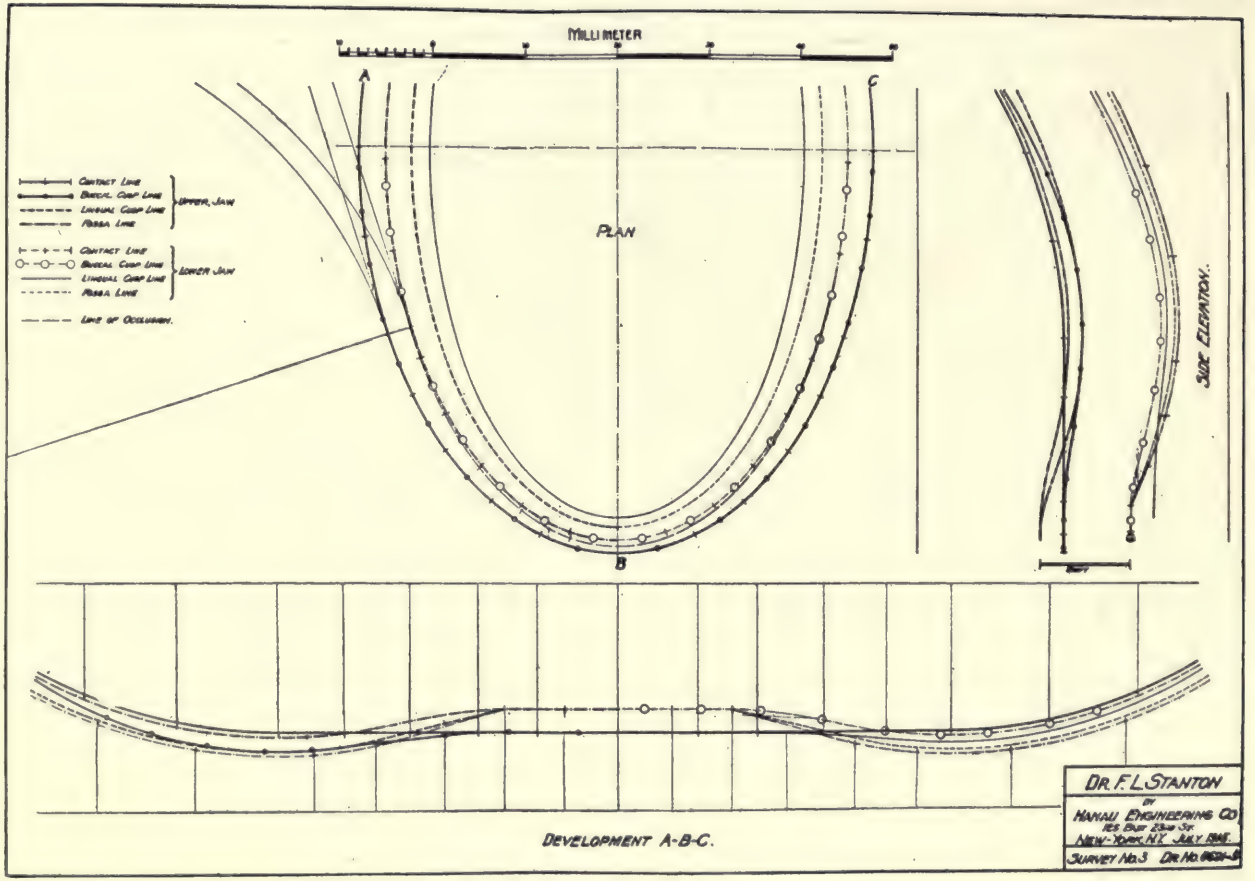

MILLIMETER
A
B
C
PLAN
SIDE ELEVATION.
CONTACT LINE
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
UPPER JAW
CONTACT LINE
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
LOWER JAW
LINE OF OCCLUSION.
DEVELOPMENT A-B-C.
DR. F. L. STANTON
BY
HANAU ENGINEERING CO
115 BROADWAY
NEW-YORK, N.Y. JULY 1916.
JAW No. 3 DR. No. 6631-B

Fig. 27.

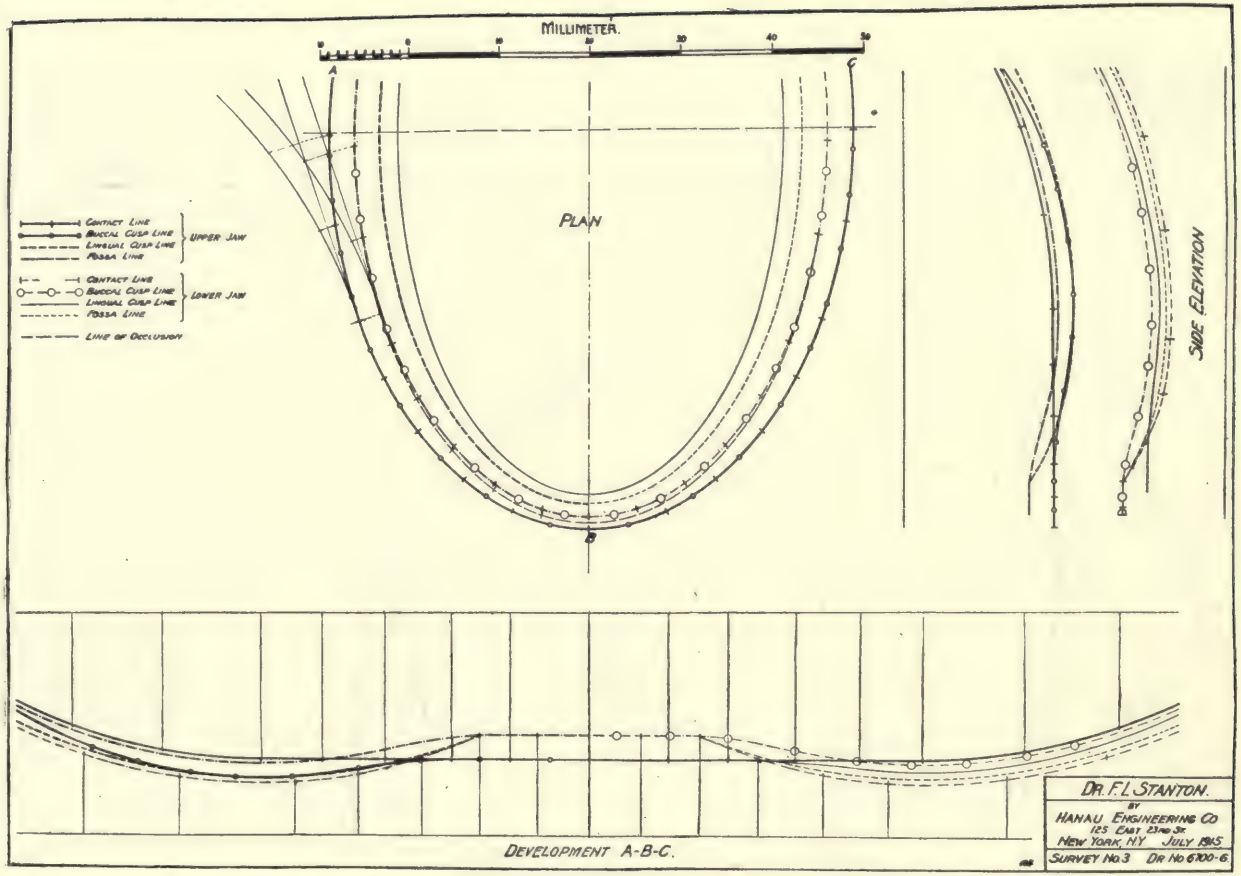

MILLIMETER.
0
10
20
30
40
50
A
B
C
PLAN
SIDE ELEVATION
CONTACT LINE
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
UPPER JAW
CONTACT LINE
BUCCAL CUSP LINE
LINGUAL CUSP LINE
FOSSA LINE
LOWER JAW
LINE OF OCCLUSION
DEVELOPMENT A-B-C.
DR. F. L. STANTON.
BY
HANAU ENGINEERING CO
125 EAST 23RD ST.
NEW YORK, N.Y. JULY 1915
SURVEY No. 3 DR. No. 6700-6.

Fig. 28.

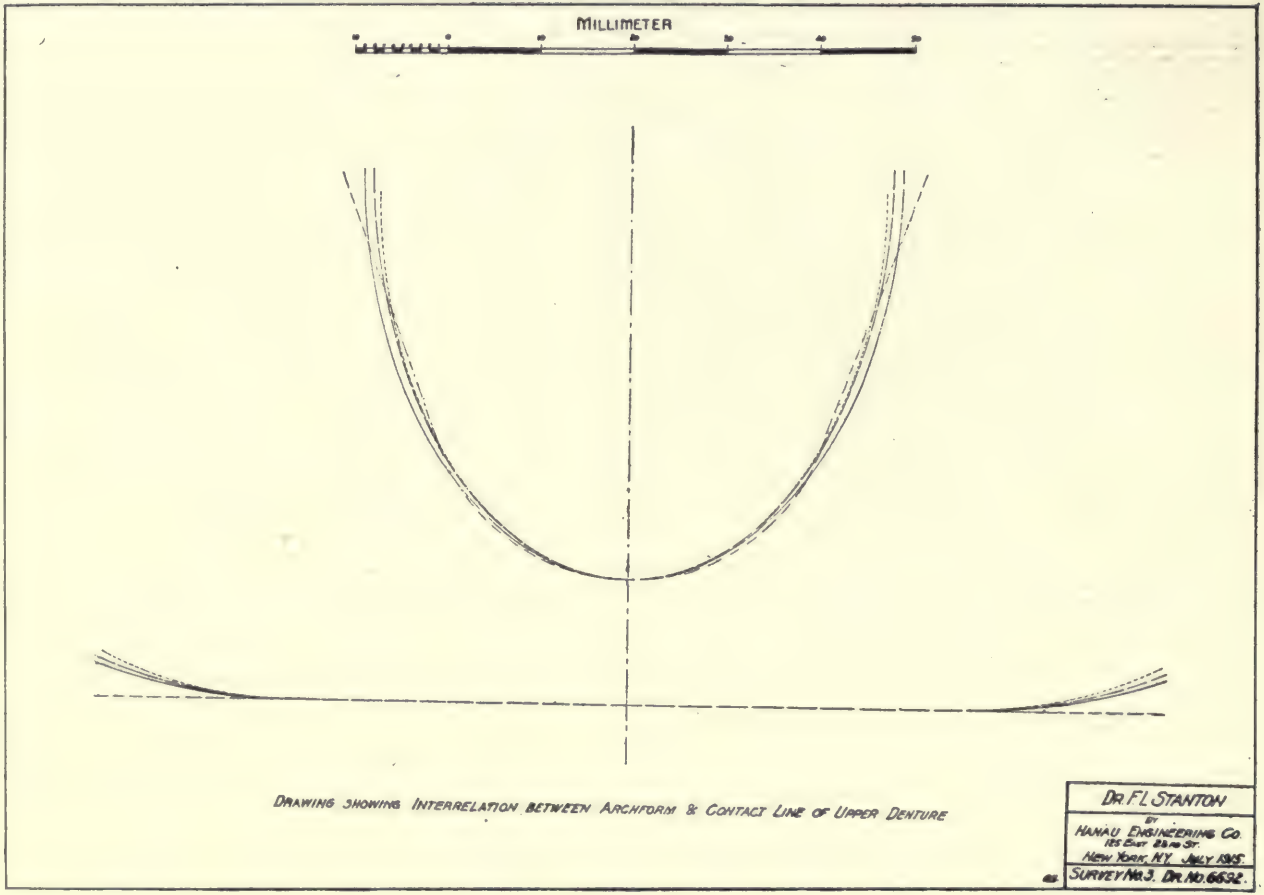

MILLIMETER
DRAWING SHOWING INTERRELATION BETWEEN ARCHFORM & CONTACT LINE OF UPPER DENTURE
DR. F. L. STANTON
BY
HANAU ENGINEERING CO.
125 EAST 23rd ST.
NEW YORK, N.Y. JULY 1915.
SURVEY No. 3. DR. NO. 6632.

Fig. 29.

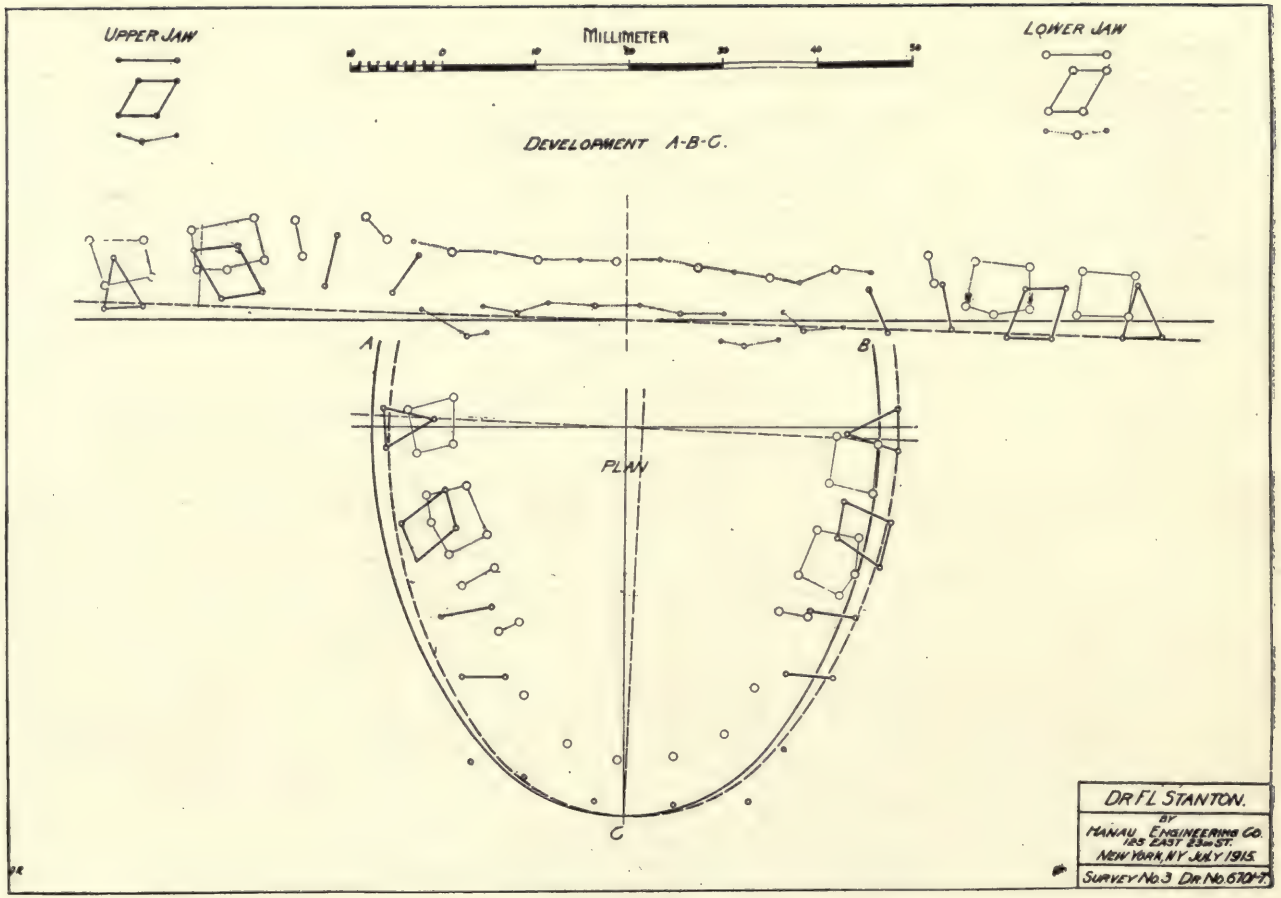

UPPER JAW
MILLIMETER
LOWER JAW
DEVELOPMENT A-B-C.
A
B
PLAN
C
DR. F. L. STANTON.
BY
MANAU ENGINEERING CO.
185 EAST 85TH ST.
NEW YORK, N.Y. JULY 1915.
SURVEY No. 3 DR. No. 6704-T.

Fig. 30.

A sagittal section is shown on the left of the drawing.

At the bottom vertical sections through the palate at the lines with Arabic numerals and each section identified accordingly. Marked asymmetry of the palate is shown by enclosing in symmetrical figure. A vertical surface, the form of the ellipse shown in the last drawing is assumed. To this surface all points surveyed are projected, then the surface is developed on the drawing plane.

(Drawing 6681-3.) (Fig. 25.) This development shows the mesio-distal relation of the teeth, and also the relative heights. While the whole development brings before the eye in one drawing and preserves the relative position of each point to all others, it must be noted the actual distance of all the points which were not in the developing surface are distorted.

The top part of the drawing shows the plan of the development. Bucco-lingual relations are correct. The straight full line is the development of the assumed ellipse. It can be seen that the assumed ellipse does not represent the line of the least tooth movment on account of the asymmetry not only of the denture but of all adjacent structures. A line of the least tooth movement could be substituted in this development by changing the direction of the line. In order to have a curve of the least tooth movement the transverse axis cannot coincide with the median suture.

Drawing 6682-4 shows the Weed case plotted. (Fig. 26.)

" 6691-5 (Fig. 27) on different ellipses.

" 6682-4 (Fig. 26) and 6691-5 (Fig. 27) are different ellipses of the same type of arch form (outside range of variation in W). Drawing 6700-6 (Fig. 28) is an ellipse type 53.8 and brings the arch form to the normal type. Note the change in the "compensating curve."

As an arch is made too narrow the compensating curve will increase in height; too wide an arch requires a flatter curve. These conditions refer to continuous curves.

Drawing 6692 (Fig. 29) shows the ellipses selected in (Figs. 26, 27, 28) and together in one drawing their apices coinciding. Also arch form similar to Hawley's arch.

In the development the necessary change in the compensating contact line of the upper jaw is shown for the various arch forms.

Drawing 6701-7 (Fig. 30). At the top of drawing is shown the plan of the development the same as 6681-3 (Fig. 25).

Heavy line is the development of the ellipse originally selected and is not the line of the least tooth movement. The dotted line would more nearly conform to our rule, the line of the least tooth movement. By

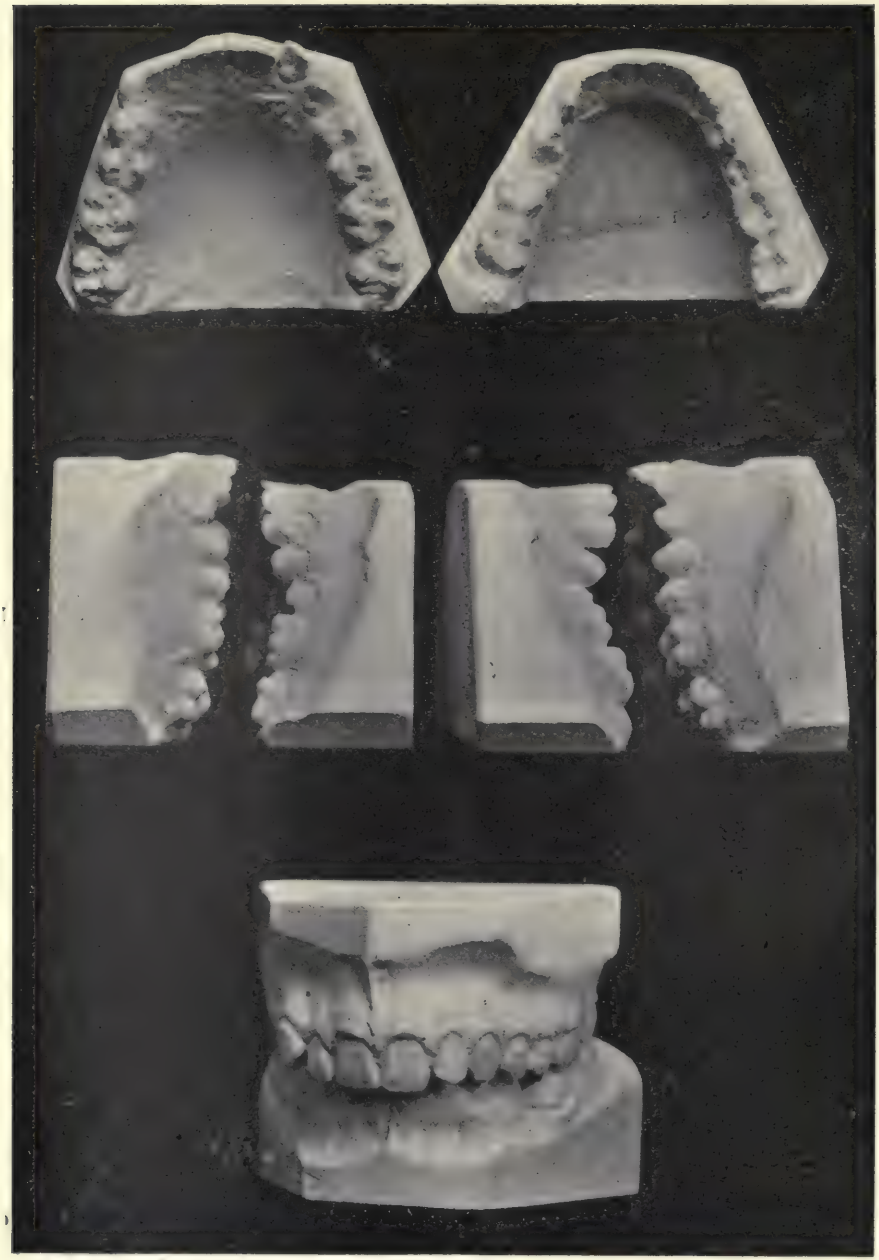


Fig. 31.

Weed Case surveyed in Figs. 23 to 30

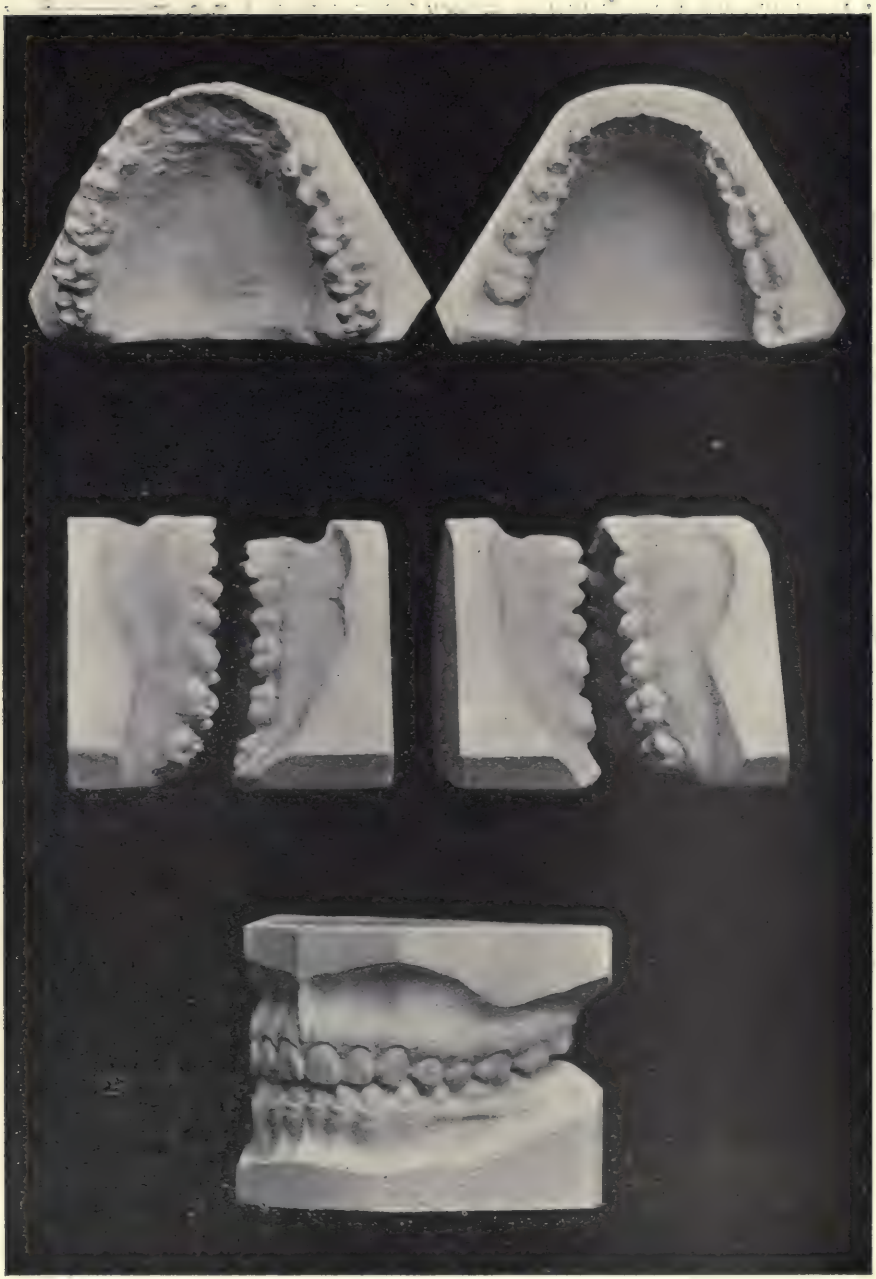


Fig. 32.

Wilks Case shown in Surveys—Figs. 20 to 22

reversing the process in the design, the dotted line is constructed in the original plan. This new figure is not a true ellipse but so nearly conforms to one that an ellipse can be substituted for it. The axis of such an ellipse will deviate accordingly.

Conclusions.

1. The form of a dental arch may be described by means of the curve that most nearly conforms to points projected to a plane. The position of the symmetry lines of the curve or its axes, if any exist, should be stated.

2. The position of a tooth in occlusion or malocclusion may be accurately stated by giving its relation to the three axes or planes assumed, *i. e.* By representing a tooth or parts thereof in at least two projections.

3. A tooth in malocclusion can only be rotated on an axis, such axis to be assumed in the tooth itself, or bodily displaced, or both, rotated and bodily displaced. Disharmonies in tooth position cannot be accurately enough detected on the plaster casts by the eye.

4. In the treatment of malocclusion curves in three dimensions should be selected that require the least tooth movement to place the teeth in normal occlusion.

5. An instrument has been needed to properly record the relation of the teeth.

6. A practical method has been lacking to bring before the profession proper records, such as are required in exact science.

7. The Surveying Apparatus enables one to make all possible measurements.

8. The new method of investigation indicated in this paper will for the first time enable orthodontists to eliminate guesswork, and therefore, substitute scientific reasoning.

Dr. Edward H. Angle's Pin and Tube Appliance.

By A. H. Ketcham, D.D.S., Denver, Colorado.

In discussing this appliance which is revolutionizing the methods of practice of many leading orthodontists, it is well to consider the advantages, also the disadvantages encountered in use.

Advantages of Pin and Tube Appliance

Among the former, attention is called to the fact that results obtained are more nearly ideal in occlusion, with more nearly correct angles of inclination of the teeth.

There is better stimulation of development of bone surrounding tooth roots; better stimulation of development of the nose cavity, and less pain for the patient.

Then, too, visits of the patient are less frequent. Patients from a distance may be treated as readily and with as good results as those nearby.

Prophylactic advantages are of moment.

The operator develops greater technical skill, forming the habit of careful, scientific observation through weighing the effect of pressure exerted by this delicate appliance.

Disadvantages of the Pin and Tube Appliance.

Among the disadvantages is the necessity for the operator who would use this appliance to the greatest advantage, to have special instruction from Dr. Angle or some skillful teacher who has had the benefit of Dr. Angle's instruction.

The technic of constructing this appliance is difficult, requiring the best efforts of even the most skillful operator. The eye and nerve strain is severe. The former may be reduced by wearing some form of prisms or loupes, while the latter is lessened as skill is acquired.

The expense and time required to construct this appliance is a disadvantage to the operator who has not developed his salesmanship sufficiently to prove easily that the benefit obtained by using this appliance is great enough to warrant the maximum fee.

Application of Force in Old and New Appliances.

Attention is called to the difference in principle of application of force between the old and the new appliances.

With the old expansion arch force is transmitted to the teeth through ligatures which must be tied tight. As soon as a tooth moves the ligature slips, irritating the gum and allowing back and forward movement of the tooth, inducing inflammation and soreness. With the new appliance, the force is transmitted without loss through a pin soldered to the arch. The pin accurately fits, telescopes and locks in a tube soldered to a band which is cemented to the tooth. By this means very gentle pressure may be employed, as all the force is transmitted to the tooth.

Inferior Materials Condemned.

The essayist also wishes to caution against the use of inferior materials in an attempt to construct these appliances. Located in Denver, which, like Los Angeles, every person who can afford to travel will sooner or later visit, he sees much of the orthodontia practiced in this country. He has been astonished to find that some orthodontists will use crude makeshifts which are lacking in strength, spring, delicacy, and the high percentage of precious metals which are contained in the appliances as developed by Dr. Angle. These appliances are manufactured by a firm which has spent thousands of dollars in perfecting machinery to produce them with the greatest degree of accuracy and at the minimum cost, and whose metallurgist is spending much time to perfect the precious metal alloys used.

This accuracy in material used by the orthodontist helps in the accuracy of his work, and when he says he is using Angle's new appliances, but is only using imitations, he is deceiving his patients. It is impossible to secure as good a result and carry on the treatment with as little pain and discomfort to the patient. Besides, the operator with crude appliances deceives himself, because he is obliged to spend more time upon a case.

To illustrate the use of these appliances the treatment of two cases will be described. But first I can do no better than to quote from a paper of the essayist read before the European Orthodontia Society in London, July, 1913:

"In offering a report of these cases a preliminary word of explanation is necessary. My object is to make use of them as a means of proving to you the possibilities in a new method of correcting malocclusion, brought out by Dr. Angle and described by him in two articles in the *Dental Cosmos,* one in the issue of August, 1912, and the other in that of January, 1913. The time limit of this paper will not permit

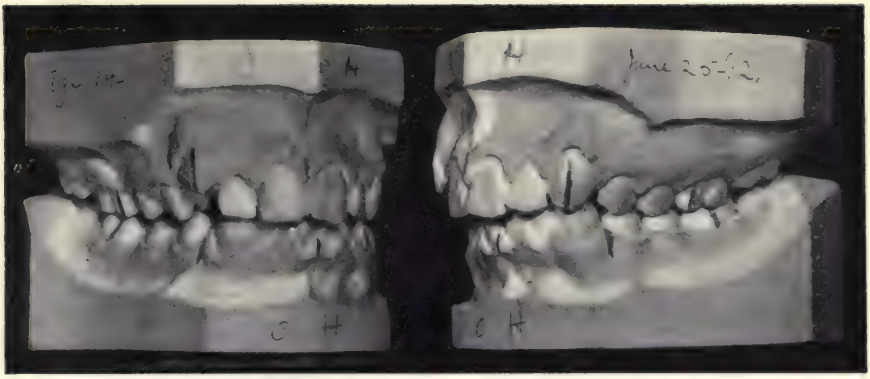


Fig. 1.

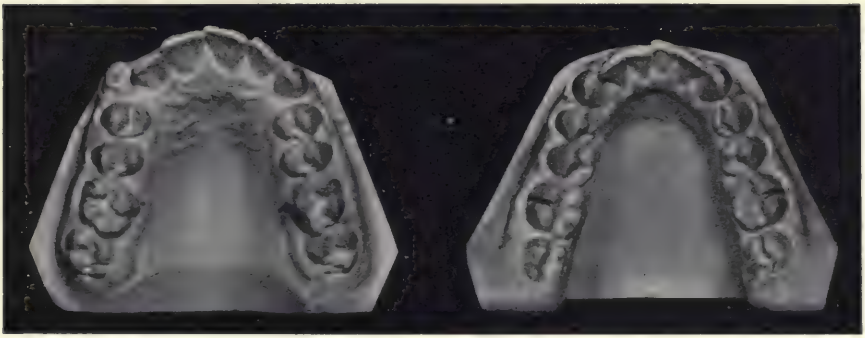


Fig. 2.

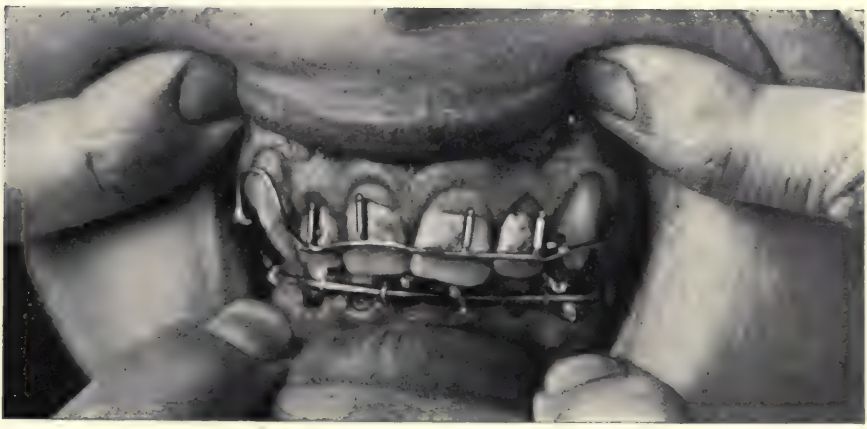


Fig. 3.

any attempt on my part to give a careful and logical description either of the appliance or of the technic of their use, nor is this necessary, for Dr. Angle has given a careful and painstaking description, not only of the appliances, but of their application and operation, such as only their inventor could give. I will, therefore, assume that you are familiar with the *Cosmos* articles in question, and, if you are not, let me advise you to study them most thoroughly. This is necessary, for while this method offers decidedly greater possibilities for attaining the ideal than

Fig. 4.

any of the various other methods that have been brought out, it also imposes deeper and more thorough study, and the development of proportionately greater skill in technic. Yet the skill and judgment necessary for the successful employment of this method is only such as the specialist in orthodontia should possess or attain by practice."

Cases from Practice. Case 1.

The first case (Fig. 1) well illustrates the point that by the use of the pin and tube appliance, treatment may be carried on even though it is impossible to see the patient oftener than two short periods each year. This case is in Class Two, Second Division (Angle) a fourteen-year-old boy. The teeth in the mandibular arch are distal to normal. Both arches are narrow.

Fig. 2.

The right maxillary cuspid is apparently in labial occlusion, but really about in the line of occlusion, with adjoining teeth in lingual positions.

This patient's home is in a mining camp over four hundred miles from Denver. During the time he has been under treatment he has attended school in Connecticut. The case presented conditions which

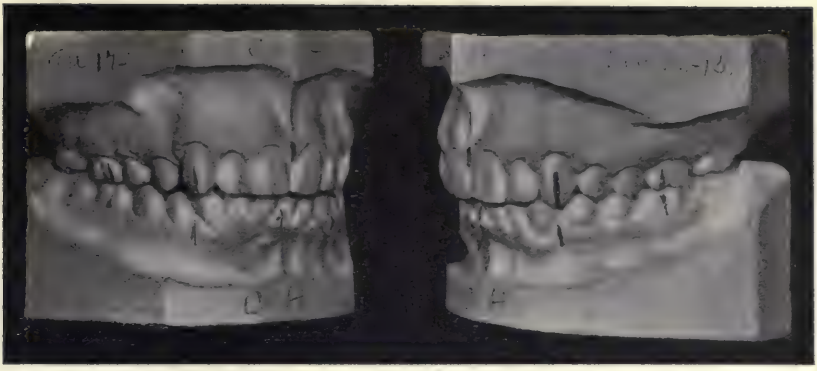


Fig. 5.

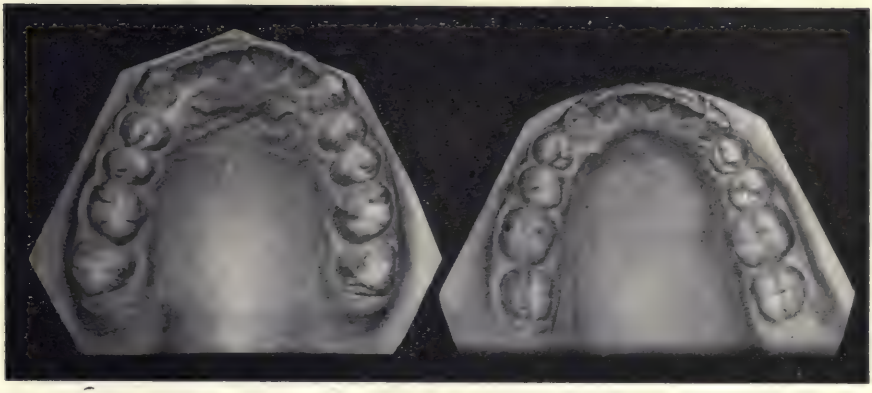


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

would make treatment with old forms of appliances hopeless. The regulations of his school were extremely rigid, making it impossible for him to be treated by an orthodontist in the East. Therefore it was necessary that treatment be carried on for a short time upon his return to Denver from the eastern school; then after a vacation at home be treated again when on his way back to school in the fall.

The following plan was carried out: The new appliance was constructed and placed upon the maxillary teeth during the first part of July, 1912.

Fig. 3. You will notice from Fig. 3 that the technic of construction of these appliances is crude. This was due partially to the fact that the only part of the appliances which could be secured from the manufacturers was the .030" and .022" retaining wire, and that the tubes, pins, square end sections, etc., had to be made by the operator. Hooks for intermaxillary ligatures are shown opposite the maxillary cuspids. This appliance was adjusted once. Upon the mandibular teeth is shown the expansion arch. The second of August the young man left for home, returning in September, when the new appliance was adjusted and the mandibular teeth retained.

Upon his return in June, 1913, it was found that the lingual wire connecting the mandibular molar bands had broken, and that the intermaxillary ligatures which had been worn during the school year had tipped and rotated the molars. So it was necessary to replace the appliance and make strenuous efforts to overcome the unfortunate effect of the misdirected force of the intermaxillary ligatures upon the teeth through the broken retainer. This was accomplished and the teeth again retained in September, 1913.

The maxillary appliance was adjusted in June, 1913, and also in September, making a total number of four adjustments of this appliance. Expansion of premolars was accomplished by use of bands carrying hooks locking over arch, as described by Dr. Angle in the *Cosmos* articles referred to.

Fig. 4. Upon his return in June, 1914, the maxillary teeth were found to be in normal positions, as shown in Fig. 4, from photographs made immediately after removing the pin and tube appliances, and prophylactic treatment—which accounts for the oozing of serum from the gums. The maxillary teeth were left without retainers. On his return in September, 1914, no treatment except prophylaxis was necessary.

Figs. 5, 6 and 7. Returning from school in June, 1915, impressions were taken from which models shown in Figs. 5 and 6 were made. Photographs of the teeth made by the patient's photographer in July are shown in Fig. 7.

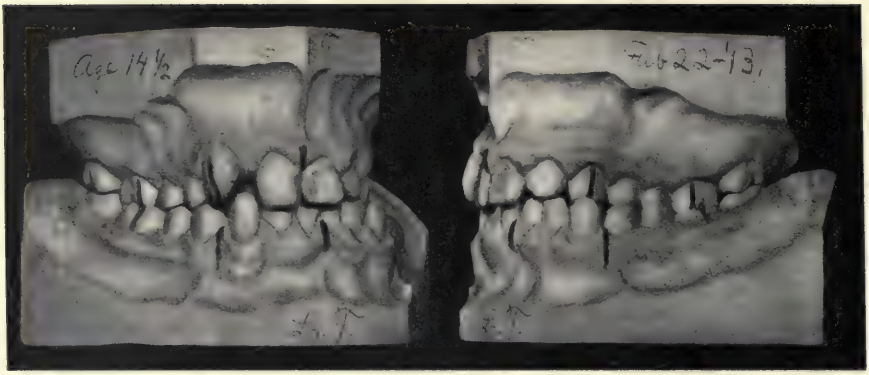


Fig. 10.

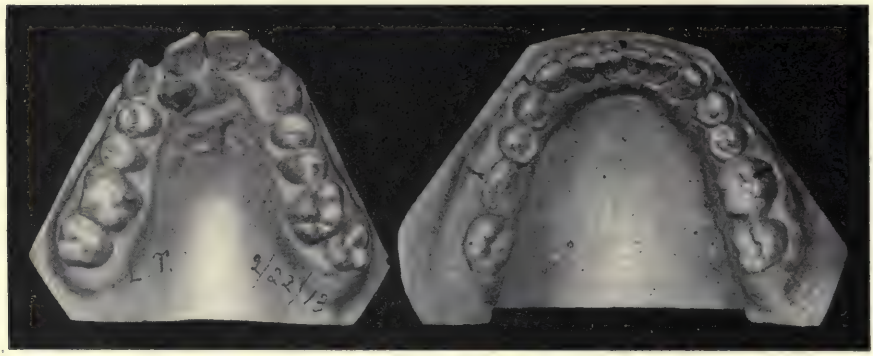


Fig. 11.

Fig. 12.

Figs. 8 and 9.

At the beginning of treatment the features exhibited the usual deformities in that the chin was lacking in strength, and the lower part of the face narrow. This is shown in Fig. 8, while Fig. 9 shows the improvement in the face usually obtained where all the teeth are placed in normal occlusion.

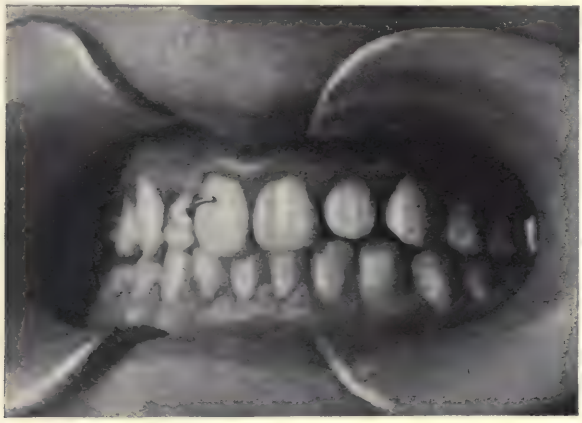


Fig. 18.

Case Number Two. Class One (Angle).

Figs. 10 and 11.

The second case is that of a boy fourteen and one-half years of age (Fig. 10). You will notice that it is in Class One, with the left maxillary cuspid, premolars and first molar in lingual occlusion; also the maxillary lateral upon the right side in complete lingual occlusion, with the premolars and first molar upon that side in slight lingual occlusion. (Fig. 11.)

This case is used primarily to illustrate the point that the small .030" arch is strong enough to move lingually locked buccal teeth out into normal occlusion.

The boy was referred by Dr. G. M. Wright, a rhinologist, who reported as follows:

"Case of L. T., a boy fourteen and one-half years old, a mouth-breather. I found a narrowed, constricted arch, with a palate bone that in its development had found it more convenient to grow up into space that should have been nasal than laterally as Nature had intended it should. In the nose I found an S-shaped septum, which I corrected with a submucous resection."

Fig. 12.

Anchorage bands were placed upon the maxillary molars with tubes carrying square end sections, the tube and end section on the right side being non-

Fig. 14.

Fig. 15.

rotating. Bands carrying tubes were constructed for the incisors and left canine, the tube upon the right lateral being very short. (Fig 12.)

The arch was constructed, carrying pins for all the tubes excepting the one upon the right lateral, which was attached to the arch by means of ligatures.

No attention was paid to the mandibular teeth except to rotate and move buccally the left second molar.

During the first year the maxillary appliance was adjusted twelve times, and between February 28, 1914, and October 11, 1914, it was adjusted six times. Practically all the adjustments were to increase the tension upon the arch on left side to move the maxillary buccal teeth over the mandibular buccal teeth.

The right lateral was moved out by use of ligatures until the crown was nearly in place. In September, 1913, a .10″ length tube was attached to band and a pin attached to arch and the root movement begun.

The case was retained in December, 1914. The maxillary first molars carried bands having upon their lingual surfaces attachment for the Angle-Young lock hook. The lingual arch was constructed from the .030″ retaining wire which held the buccal teeth in their new positions; the right lateral having a band with spur resting over the labial surface of the adjoining central.

Fig. 13. From Fig. 13 it may be seen that the left lateral and cuspid are in slight labial occlusion. This was due to pressure of the lingual arch against these teeth, and has been overcome.

During the first year's treatment the boy made a gain of twenty-three pounds in weight and three inches in height, growing from the runt in a large family of boys to the tallest. His breathing has become normal and he is now a good specimen of active, healthy and vigorous youth.

Figs. 14 and 15. Figs. 14 and 15 show the effect of treatment upon the features. Note the improvement in strength of mouth, lips and lower part of the face.

Figs. 16 and 17. Figs. 16 and 17 are from models showing the teeth at the present time. It will be noted that the left lower first permanent molar has a flat filling. His dentist will soon change this for a restoration carved so as to reproduce the normal surfaces of the tooth.

Softening the Arch Metal. A few points in the application and adjustment of these appliances should be emphasized: First, the arch wire must be thoroughly and evenly softened before being bent to conform to the positions of the irregular teeth. This is best accomplished

by placing it in the (Angle-Ketcham) arch annealer (Fig. 18). After heating to a red color, plunge into water in tray simultaneously with the breaking of the electric current by turning the knob upon the right side of annealer. This softens the arch wire to a remarkable degree so that it may be bent to conform to the positions of the irregular teeth without danger of breaking.

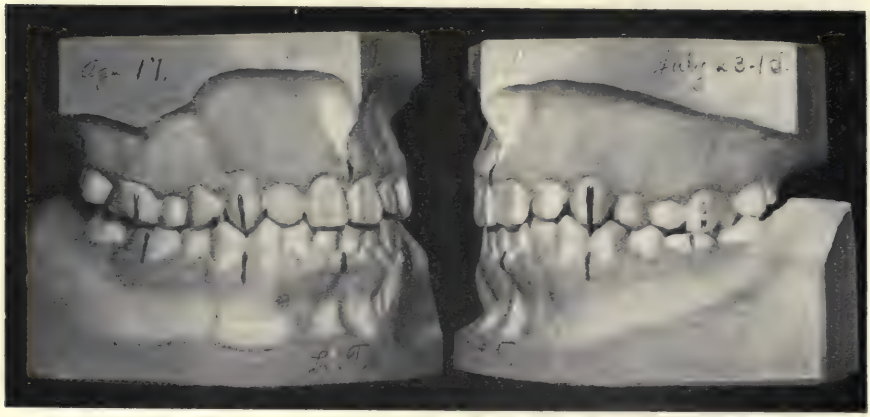


Fig. 16.

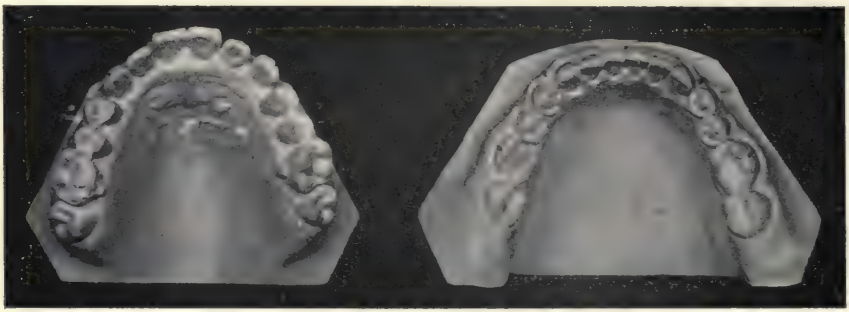


Fig. 17.

Then after all pins are soldered to the arch, and appliance is finished, it is returned to the annealer, heated and plunged as before so as to soften evenly. In this inert condition it is placed in the mouth and worn for a few days until patient is thoroughly accustomed to its presence.

Adjustments are made by first softening appliances in annealer, as described. Then using either Angle or Young pliers the arch wire is

straightened enough to throw the pin just the width of the wall of the tube in the direction that it is desired to move the tooth.

To rotate a tooth the arch wire is held at point of attachment of the

Fig. 18.

pin with pliers and with another pair bent so as to press against the outstanding portion of tooth. Cuspids as well as incisors are readily rotated by this means.

Hardening the Arch Metal.

After adjusting, which is most accurately performed through the use of Dr. Robert Strang's archeograph*, the arch is returned to the annealer, heated to a dull red color, then allowed to cool slowly before removing. This restores the

Dental Cosmos, October, 1913.

original spring to the arch wire. The adjustments should not be oftener than once a month.

The possibility of causing absorption of the ends of roots of teeth has been called to the attention of orthodontists. That there is such a possibility through the misuse of the pin and tube appliance is the conviction of the essayist; but that there is such a possibility where any appliance is used is also his conviction. Also that there are teeth with roots having all the appearance of absorption, which have never been disturbed by orthodontic procedure, has been revealed through experience in dental radiography covering a period of eleven years.

Fig. 19.

All teeth which are to be moved should be radiographed before the placing of appliances on account of criticism which may come up if later the roots are found to be short. Teeth with well-formed crowns may have very short roots (Fig. 19). In cases where the appliance is placed upon such teeth without radiographs, and subsequently it is discovered that the roots are short, the natural tendency is to lay the blame upon the operator and the appliance. There is now an orthodontist who is fearing a lawsuit because short roots have been discovered in a case where he neglected to have radiographs made before starting treatment.

Loops in the Arch.

A word in regard to loops: Loops in the arch have been termed "Root Wigglers." The essayist feels that he has made a mistake in using too large loops, either between teeth or over protruding teeth, like the right maxillary canine in Fig. 3. He finds that with the arch more nearly in a straight line he can secure more accurate pressure through the square end section, so advises against the use of excessive

loops either between the anchor tooth and the cuspid or between incisors.

He does advise, however, the use of loops in those cases of small children where the anchorage is upon the temporary cuspids.

Modifications.

The essayist frequently modifies the appliance to more readily adapt it to the case in hand. Through Dr. Angle he prevailed upon the manufacturer to make shorter tubes than those first placed upon the market, as he found from experience that tubes .10″ in length were better for the majority of cases than the .15″ tubes. These, with pins to fit, have been upon the market for the last year or so. In cases where the permanent lateral incisor is erupting close to the first temporary molars, or in older cases where it is close to the first premolar, an even shorter tube than the .10″ is indicated; so that when the nut upon the squire end section is tightened there may be some tipping outward of the crowns of the incisors. Otherwise, the incisor resistance may be found to be stronger than the molar resistance, so that the incisor crowns are not moved labially as far as indicated.

Another modification of the appliance which the essayist has found very good in Class I cases of children from five to eight years of age, may be used instead of the simple and efficient method of Dr. Angle's for gaining expansion in these cases—which is to attach a wire from one mandibular cuspid to the other, then pinch with his wire-stretching pliers. This necessitates seeing the patient once a week, at which visit one pinch is given the wire.

An appliance which should not be adjusted oftener than once a month may be constructed by banding the temporary cuspids, extending a spur from the lingual side of each band back of the first temporary molar, and soldering a .10″ length tube to the labial surface of each band. In the case of the mandibular cuspids the tube should be close to the gingival margin to escape the maxillary teeth in occlusion. Sometimes in case of a shallow over-bite, the lingual surface of the band is extended by soldering a piece of clasp metal to the lingual surface, allowing it to extend upwards so as to touch the lingual surface of the maxillary cuspid.

A section of the .030″ retaining wire is used to make an arch extending from cuspid to cuspid, looped gingivally between cuspid and central incisor, incisally at the median line to escape the frenum, then gingivally again over opposite lateral. The pin attachment telescoping the tubes is the Butler latch hook made from the .022″ retaining wire, described in the *Cosmos* for May, 1914. A modification is used, how-

ever, in that the latch hook instead of being fully U-shaped is L-shaped.

To adjust, the arch section is removed and straightened slightly, just enough to bring one of the pins—when the other is in the tube—buccally the width of the wall of the tube.

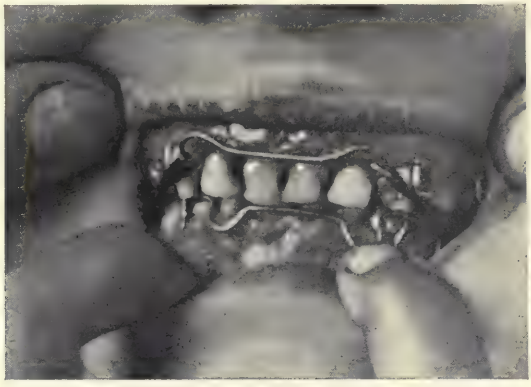


Fig. 20.

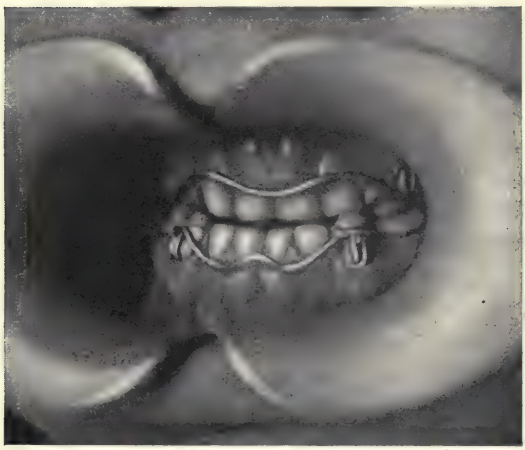


Fig. 21.

Care must be used not to put too much spring upon the arch, as it will move the teeth too rapidly; and when applied to the mandibular teeth alone will move the cuspids so rapidly that the maxillary teeth will not be influenced and expanded fully through the force of occlusion with the lowers.

This appliance is really the anterior portion of the appliances shown

in Figs. 20 and 21, which are modifications along lines suggested to the essayist by Dr. J. Lowe Young.

Fig. 20. Fig. 20 is of a five-year-old boy having a case in Class 2, Second Division. The arches are made of the .030″ retaining wire and extend to bands upon second temporary molars, attachment to bands being through the Angle-Young lock. Hooks for intermaxillary ligatures are shown upon maxillary arch just anterior to cuspids, with ligatures in place. Below, the ligatures are slipped over the locking device on molar bands. This appliance was constructed in July, 1912.

Fig. 21. Fig. 21 shows recent developments as used by essayist in a five-year-old boy's case, Class 3. Note the neater loops in arches. Hooks for the intermaxillary ligatures are soldered to the arch just posterior to the mandibular canines. The ligatures extend from these hooks back and over ends of horizontal tubes upon maxillary second temporary molar bands.

Attachment of arches to bands upon second temporary molars is through horizontal buccal tubes which accurately fit the .030″ arch wire, and are of sufficient length to prevent lengthening and tipping of the molars.

The essayist finds these delicate appliances beautiful in their simple, graceful lines, effective in the treatment of all cases—a great boon to his patients.

The Line of Occlusion.

By Rodrigues Ottolengui, M.D.S., LL.D., D.D.S., New York.

By way of preface, the writer desires to state that some time after writing this manuscript he heard of the work of Dr. Stanton, which is to be presented at this Congress. Dr. Stanton claims to have perfected a system of determining just what the line of occlusion should be for a given case. The writer sincerely hopes that Dr. Stanton has succeeded in this, because if so we all should then be in the position of the architect who has the "line" up to which he must build.

In addition to the value of a concrete mental picture of the line of occlusion as an aid to diagnosis and prognosis, it likewise establishes a definite meaning to the several malpositions of individual teeth. As, for example, what do we mean by labial occlusion, or "labio-version," to use Lischer's term? The best that any writer has told us is that a tooth is in labial occlusion, or labial-version, when it is "labial of normal." Thus the diagnosis depends entirely upon the examiner's individual notions of what the normal really should be. The writer believes that we should and can be more definite than this.

The Line of Occlusion.

Early writers often alluded to the fact that teeth should be in proper "alignment," and have even spoken of the "line of the arch," but I believe that Dr. Edward H. Angle was the first to attempt a definition of the "line of occlusion." In the sixth edition of his work, entitled *"Malocclusion of the Teeth,"* he defines the line of occlusion as being "the line of greatest normal occlusal contact," but in the seventh edition of the same work he tells us that he has come to consider that definition as inadequate, and he then describes the line as being "the line with which, in form and position, according to type, the teeth must be in harmony if in normal occlusion."

With an expression of complete respect to this noted authority, I take the liberty of stating that even this latest definition appears inadequate, and that indeed in one respect it lacks an essential which is contained in the first. It seems preferable to state that the teeth must be in

"contact" with the line of occlusion rather than in "harmony" with it. This for the reason that when we come to a description of the various malpositions of individual teeth it is easier for the mind to determine that a tooth is not in normal contact with the line of occlusion than it would be to decide that it were out of harmony with it.

The word "harmony" in this connection seems wholly unsatisfactory because of its inexactness. Just what is meant by contact is easily demonstrated and as readily comprehended; but what is meant by teeth being "in harmony" with the line of occlusion might well puzzle the student, since what might seem very harmonious to one person might be most inharmonious to another. In definite relation to occlusion and malocclusion there are innumerable instances which the inexpert mind might decide to be in harmony with his image of the line occlusion, simply because the general curve of the arches seem symmetrical, and the interdigitation of the teeth when the two jaws are brought together appears to be good; and yet to the expert, with his knowledge of the principles involved in the mechanics of mastication, and with a comprehension of that perfection with which the dental organs can be made to perform their functions when properly interrelated, an entirely different image of the line of occlusion would cause him to declare the same case to be totally out of harmony.

While admitting the difficulty of formulating a readily comprehended and yet wholly accurate definition of the line of occlusion, I shall yet venture to make such an attempt, hoping that still some other writer may at some time construct a better.

The following then is offered as a definition of the line of occlusion:

The line of occlusion is an imaginary line with which each tooth must come into definite contact when the jaws are closed, in order to establish normal occlusion; this line, varying in shape to accord with type, in one of its aspects describes the parabolic curve of the dental arch, while in another it coincides with the occlusal plane

Definition of Line.

Since we are to adopt this so-called "line of occlusion" as the standard by which to determine what is and what is not malocclusion, it may not be amiss first to get fixed in the mind a definite idea of what we shall mean when using the word "line," more especially as the Standard Dictionary records no less than thirty-seven meanings for this word. Let us then adopt as most nearly approximating our idea that definition which reads: "That which is conceived to have length without any other dimensions; as, the boundary of a surface."

There is another definition, however, which may aid us, which reads:

"The edge of a thing." I call attention to this latter meaning because it will help us out of a difficulty. I wish the student to think of the "line of occlusion" really as having no other dimension except length, yet for the purpose of making clear the terms used for malpositions of individual teeth I intend to picture this line as touching the teeth at definite places, and when we do this we at once seem to attribute to the line of occlusion width as well as length, for the reason that if we view a set of teeth

Fig. 1. Visualization of the area of greatest normal occlusal contact.

from the buccal aspect, the line of occlusion must be drawn as crossing between the buccal cusps of the upper and lower molars; whereas, if we study the same teeth from the lingual side, the line of occlusion then seems to cross between the lingual cusps, so that apparently the line in this region would have a width which would be only a fraction less than the width of the molars. But we must not so think of the line; our concept of it must always be the mathematical line, which has length, but neither depth nor thickness. This must be made more clear.

Let us suppose that we have in our hands a skull in which all the teeth are present and in ideal occlusion. Take a sheet of moderately heavy tin foil, place it between the masticating surfaces and force the teeth into occlusal contact. Trim all the excess of tin away so that nothing remains except that which is in actual contact with those parts of the teeth which would be in occlusal contact with one another if the sheet of tin were removed (Fig. 1). With the tin in place, if we view the skull now from the buccal point of view we will observe a "line" which is the "edge" of the tin, and it is for this reason that I quoted that definition of "line" which declares that it is "the edge of a thing." And it is

this "edge" or "line" which gives us one aspect of the line of occlusion (Fig. 4). But if now we look at the skull from the lingual point of view, again we see an edge of the tin, which again is the line of occlusion, but this is really to be counted as the same line, and whether we study it from the buccal or from the lingual viewpoint we may determine from it the occlusal plane (Fig. 4).

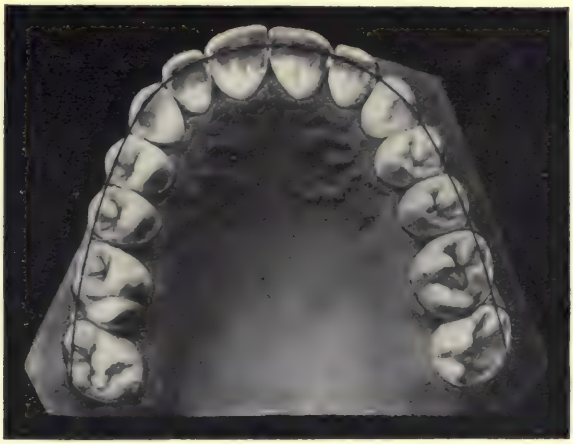


Fig. 2. Visualization of the labio-buccal aspect of the line of occlusion crossing the teeth of the upper arch.

If now we carefully remove the tin from between the jaws and hold it vertically before us, that is to say, as when we look at a horse-shoe with its ends pointing earthward (Fig. 1), the piece of tin will be seen to have width, and this may occasion some momentary confusion in the mind, since we are calling it a "line.' But here we must only think of the "line" as the "boundary of a surface." The line of occlusion as depicted by the tin must therefore be either the labio-buccal or the lingual boundary of the metal, and either of these will enable us to determine the parabolic curve of the arch (Figs. 2 and 3).

One other point must be alluded to. We see readily that in the experiment with the tin we bring into physical existence through the use of the tin an exact reproduction of what Angle called the "greatest normal occlusal contact," which is exactly what the line of occlusion is. But, however we look at this metallic reproduction of the area of greatest occlusal contact, we find it to be irregular, because of the imprints made by the cusps of the masticating teeth. But in utilizing it as a standard by which to determine the existence or non-existence of malocclusion we must ob-

literate from our mental picture all thought of these irregularities or convolutions, and we must reduce our thought of the line of occlusion to that physical picture of a line which has length, but neither breadth nor thickness.

I have said that the line of occlusion may be utilized to determine either the parabolic curve of the arch or the occlusal plane; likewise that this diagnosis may be made with equal accuracy either from the labio-buccal or from the lingual aspect of the line.

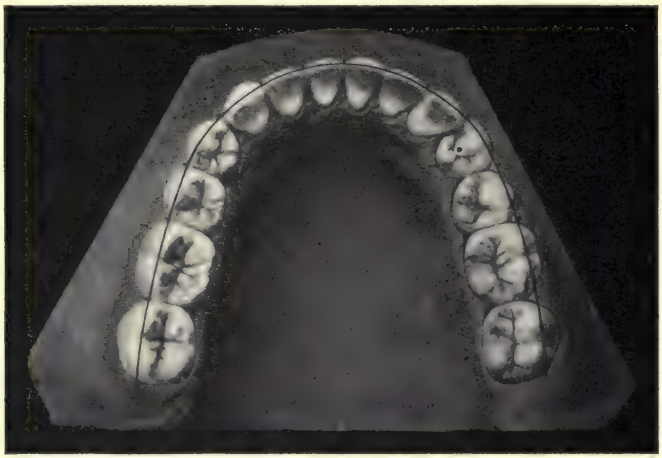


Fig. 3. Visualization of the labio-buccal aspect of the line of occlusion crossing the teeth of the lower arch.

To simplify the standard by which we are to describe malocclusions we would best choose a fixed and single aspect of the line, and it will be found more practical to select the labio-buccal viewpoint. Thus, as determining the parabolic curve of the arch, we have here illustrated it as the outermost or labio-buccal border of the contactual surface (Figs. 2 and 3), and for the determination of the occlusal plane we again gaze upon it from the labio-buccal viewpoint and draw it as depicted in Fig. 4.

In passing, let me emphasize the fact that this labio-buccal picture of the line is to be utilized solely as a basis of definition of what constitutes malpositions of the teeth, and consequently malocclusion. When using the line of occlusion as a basis for diagnosis, either before or after treatment, the lingual aspect of the line should never be overlooked, but on the contrary should be an ever-present standard for the ultimate measure of the result of the work of the specialist, because slight deviations from true normal occlusion of a very important character from the stand-

point of function may often be more readily discernible from the lingual than from the labio-buccal study of relations.

Line of Occlusion a Basis for Diagnosis.

How, then, may we utilize the line of occlusion as a basis for diagnosis? Let us first study the line from that aspect which determines the parabolic curve of the arch. This line, of course, is imaginary, and in making a picture of it we may inscribe it anywhere within the limits of the area of occlusal contact (Fig. 1). But returning

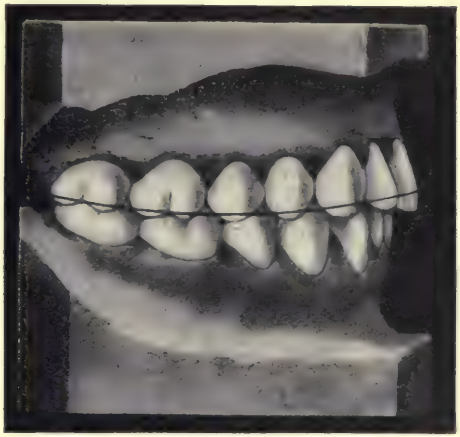


Fig. 4. Visualization of the aspect of the line of occlusion which depicts the occlusal plane.

to our experiment with the tin, let us inscribe the line as depicting the outermost or labio-buccal border of the tin.

And here let me pause to say that, as we have seen that viewed from either the buccal or the lingual aspect we have a definite standard established both of occlusal plane and arch curve, for general study purposes we may confine ourselves to the labio-buccal edge, or boundary, of the tin replica of the line, limiting our studies of the lingual edge or boundary to such occasions as when lingual relations of the teeth are to be considered.

Let us then inscribe a figure of the line of occlusion along the outermost border of the incisive and buccal contact. As the upper arch is larger than the lower, it is manifest that the line of occlusion will thus touch the teeth at different relative situations in the upper and lower jaws. In Fig. 2 we see such an image of the line of occlusion drawn upon the upper teeth, and Fig. 3 depicts the same line as it comes into contact with the lower teeth. We have declared that the line has length, and for a purpose presently to be pointed out more specifically we may divide the

length of the line by making short cross lines, corresponding with the spaces between the teeth, as has been done in both Fig. 2 and Fig. 3.

We have said that normal occlusion demands normal contact of all the teeth with the line of occlusion. We must therefore determine just what the normal contact with the line may be for each tooth.

Normal Contact of Teeth with the Line.

Perhaps the most noteworthy fact is that only four teeth fail to cross the line. These are the four lower incisors, the incisive edges of which should touch the line (Fig. 3). This statement perhaps might be modified in that type of teeth which has the

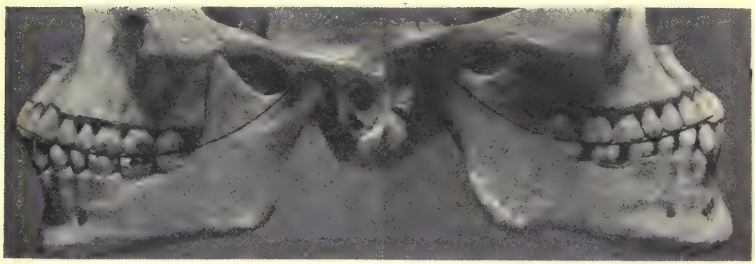


Fig. 5. The curve of Spee. Turner. American Text Book of Prosthetic Dentistry.

shortest normal overbite.) The four upper incisors, on the contrary, cross the line (Fig. 2). This is necessary to establish the incisive region overbite. The length of this incisive overbite, or the distance to which the upper incisors should cross the line of occlusion, has been said by some writers to be equal to about one-third of the length of the crowns of the incisors, but this is probably the extreme limit of any normal overbite, as it may be less in types of teeth where the cusps of the cuspid teeth are short.

All the other teeth, cuspids, bicuspids and molars cross the line of occlusion. Therefore their normal points of contact with the line of occlusion are slightly rootward of the crests of their cusps, the distance of these contact points from the crest of the cusps being here also definitely related with and controlled by the type of teeth and the length of the cusps. Thus, in a general way, the student may first examine a set of teeth, and if he sees that the cusps are long, then the teeth should cross the line of occlusion considerably, and if the cusps are found to be short the extent of the crossing should be less.

Tracing the line of occlusion upon the upper arch (Fig. 2), we observe that it is slightly lingual of the outermost boundary, crossing the

molars, bicuspids and the cuspids slightly rootward of the crests of their cusps and passing similarly along the lingual surfaces of the incisors a third of their length, or less, from their incisive edges.

In the lower arch (Fig. 3), the line of occlusion, and remember that it is exactly the same line, is found to be in contact with the extreme incisive edges of the incisor teeth, whence it dips slightly rootward, passing across the labial surfaces of the cuspids and thence across the buccal surfaces of the bicuspids and molars, slightly rootward of the crests of the cusps.

With the assistance of Fig. 2 and Fig. 3 we have obtained a more or less definite idea of the positions of all the teeth in their relation with the parabolic curve of the line of occlusion. We have now to consider their relations with the line as it describes the occlusal plane, which likewise is a curve, or part of the arc of a circle.

In the *"American Text-book of Prosthetic Dentistry"* (Turner, Fourth Edition, pp. 221-222) we find the following:

"If a curved line be drawn touching the summits of the buccal cusps of the upper teeth from canine to third molar, it will more or less accurately correspond to the arc of a circle with its convexity downward (Fig. 5; Fig. 198 of Turner). The upper lingual cusps will be found to occupy a similar line and both series of cusps of the lower teeth correspond to the arc of a circle. . . . This is frequently spoken of as the 'compensating curve' of the molars and bicuspids, and also as the 'Curve of Spee,' by whom it is described."

I have said that a study of the line of occlusion from the labio-buccal (or lingual) aspect will indicate the occlusal plane, and usually the dental mind accepts the compensating curve, or Curve of Spee, as being likewise an indicator of the occlusal plane. For the purposes of diagnosis of malposition of the teeth, I must point out a radical difference between the Curve of Spee as described and figured by Turner (Fig. 5) and as I wish it to be pictured in the mind of the student of orthodontia. For this purpose I have drawn it as shown in Fig. 4.

In Turner's illustration (Fig. 5) the compensating curve is drawn as touching the crests of the cusps and incisive edges of all the teeth of the lower arch, and he tells us that the same is true with the upper teeth; indeed, he so depicts it in other illustrations. This is perfectly adequate when studying the Curve of Spee, but would give us some very erroneous ideas in regard to malocclusion. If we should think of such a line (Fig. 5) as indicating the labio-buccal edge of the true occlusal plane, when the teeth are closed we would obtain a false basis for diagnosis, because the occlusal plane, with which both sets of teeth are in contact

at one and the same time, does not cross the crests of the cusps, as depicted in Turner's figure of the compensating curve, but bisects the cusps of the bicuspids and molars of both jaws, as I have tried to indicate in Fig. 4.

The question of treatment need not be considered here, but many beginners in orthodontia have made serious errors in treatment by overlooking the fact that the outermost point of occlusal contact of the buccal cusps of the upper molars with the lower is not along the crests of the cusps of the lower, but buccally of and rootward away from the actual crests of the cusps of the lower molars.

There is an important fact stated by Turner which may advantageously be quoted here:

"The canine tooth occupies a position between the incisors and the masticating teeth, and hence is intermediate in the character of its occlusion. Where from the shape of the arch it continues the line of the molars and bicuspids, it partakes more of their type of occlusion, and its overbite corresponds to the overlapping of the molars and bicuspid cusps and is proportioned to them in this regard. When its position is more in the line of the incisors, it partakes of their type of occlusion, while if it is intermediate in position, it participates in the character of both types of occlusion." This must be borne in mind in any study of the line of occlusion, when accepting it as a guide to the position of the cuspids in relation with the occlusal plane, the extent to which the cuspid should cross the line of occlusion, being thus definitely related with the form of the parabolic curve of the arch, and the position of the cuspid along that curve.

Thus it will be seen from the two illustrations, Figs. 2 and 3, that each tooth has a definite contact with the line of occlusion. Considered from that aspect which describes the parabolic curve of the arch, we note that normally on the upper arch the incisive edges of the incisors, the crests of the cusps of the cuspids, and the crests of the buccal cusps of the bicuspids and molars, are all external (labial or buccal) of the line; whereas in the lower arch the incisors touch the line at their incisive edges, while the crests of the cusps of the cuspids, and the crests of the buccal cusps of the bicuspids and molars fall slightly within, or lingual of the line of occlusion.

Considered from that aspect which delineates the occlusal plane, we see from the illustration (Fig. 4) that with the exception of the lower incisors (Figs. 2 and 3), which just touch the line, all others cross it.

If now we inscribe short lines crossing the occlusal views of the line of occlusion, placing these cross lines immediately opposite to the

interproximal spaces, with the aid of these cross lines we can determine the exact distance at which each tooth should be placed in relation to the median line, which should be at the interproximal space between the central incisors, above and below.

Moreover, if we remember that the line of occlusion should pass directly through the greatest mesio-distal diameter of each tooth, then with that segment of the line of occlusion, which lies between any two stated cross lines, we can determine whether or not the tooth which should occupy that particular situation is or is not in normal relation and occlusion.

Malocclusions of Individual Teeth.

A tooth may occupy any one of seven malpositions, and it is even possible for it to be malposed in four ways.

These malpositions have been named, as follows (Angle):

1. Labial or buccal occlusion. 2. Lingual occlusion. 3. Mesial occlusion. 4. Distal occlusion. 5. Supra-occlusion 6. Infra-occlusion. 7. Torso-occlusion.

In the past there has been some confusion in the minds of beginners in regard to the use of the word "occlusion" in the above nomenclature, and it is for this reason that I have been at such pains to describe an even picture the line of occlusion. Whilst it is true that in a dental sense the word "occlusion" means "The relation between the upper and lower teeth when the jaws are closed," malocclusion, more especially of the individual teeth, is not to be so studied. That is to say, the malocclusion of a particular tooth does not mean an abnormal relation with its antagonists of the opposite jaws, although that fact, of course, would necessarily be included, but rather malocclusion means an abnormal relation or incorrect contact with the line of occlusion.

Let us express it in another way. We have seen that each tooth should normally occupy a definite position when brought into occlusion with (closed against) or brought into contact with our imaginary line of occlusion. Consequently, if we could but determine the exact form of the normal line of occlusion for a given set of teeth, and if we could apply it to the teeth (as in Figs. 2, 3 and 4), we could at a glance determine whether one or more teeth were in malocclusion, and by comparing the actual position of a given tooth with the position in relation to the line which we know it should occupy, we could then determine the exact nature and extent of the malocclusion.

Malocclusion of a single tooth then means a malrelation or malposition with reference to its normal relation or contact with the line of

occlusion, and is not to be primarily based upon its relation with the opposing tooth or teeth.

To make this more clear, we know that the upper and lower second molars should normally occlude in a definite manner. Let us suppose a case in which the first molars on one side have been extracted early in life, so that the second molars have erupted immediately distal of the bicuspids. These two second molars might occlude, the one with the other, exactly as they would have done had they erupted in their proper places, so that thus studied, one might conclude that they were in normal occlusion, whereas if examined with reference to their proper contact with the line of occlusion, rather than with one another, it would be seen instantly that both were in mesial occlusion.

Of course, in the case cited, the shapes of the teeth showing them to be second molars, their occlusion and approximation with the second bicuspids would likewise indicate their malposition and malocclusion, but we have already declared that malocclusion includes the idea of a false relation with the opposite teeth. The point here to be impressed upon the mind is that the terms used are to be understood as indicating a false relation or malocclusion with the normal line of occlusion, and is entirely aside from false relations with antagonizing teeth, which false relations of course would nevertheless be related to and dependent upon the individual malocclusion.

Malocclusions Defined.

Labial or buccal occlusion then means that the tooth crown is so malposed that its point of contact with the line of occlusion is labial or buccal of its normal situation.

Lingual occlusion means that the tooth crown is so malposed that its point of contact with the line of occlusion is lingual of its normal situation.

Mesial occlusion means that both the mesial and distal surfaces of a tooth are mesial of that position indicated along the line of occlusion by cross lines set to mark its true situation.

Distal occlusion means that both the mesial and distal surfaces of a tooth are distal of that position indicated along the line of occlusion by cross lines set to mark its true situation.

Supra-occlusion means that a tooth has erupted abnormally from its socket so that the point of contact with the line is found to be beyond the line rather than in normal contact with it.

Infra-occlusion means that a tooth has failed to erupt normally so that the point of contact with the line of occlusion falls short of reaching its normal contact with the line.

Torso-occlusion means that a tooth is so turned in its socket that the

line of occlusion does not pass through its greatest mesio-distal diameter.

Thus it is seen that it is the abnormal situation of the true area of normal contact with the line of occlusion, which determines the nature and extent of a malocclusion of an individual tooth. Whilst this fact explains the true meaning of all seven of the above malocclusion terms, it especially clears up all confusion in regard to the terms supra- and infra-occlusion, which terms have been criticised. It has been declared by some writers that the terms supra- and infra-occlusion are inadequate, because whatever may be the abnormality of the elevation of a tooth in its socket it cannot be above occlusion. It is here manifest that this criticism is based upon the erroneous idea that the abnormality is to be determined by the relation of the tooth to its antagonist, whereas, as we have shown, it is to be studied solely in its relative position with the occlusal line.

Again we are told that what is "supra" in the lower teeth would be "infra" in the upper. This likewise is based upon a study of the teeth as they are situated in the head, whereas the term relates solely to the eruption of a tooth out of its socket, toward the line occlusion; thus, if eruption ceases before the normal contact touches the line of occlusion it is "infra," or under the line; and conversely if the eruption continues until the contact point is abnormally beyond the line, it is "supra" or above the line.

Finally, then, these seven positions of malocclusion of individual teeth are determined by the relation of their points of normal contact with the line of occlusion, and not by their positions in the skull, nor by their relationship with antagonizing teeth.

Further Evidence as to the Influence of the Forces of Occlusion on the Development of the Bones of the Skull.

By Lawrence W. Baker, D.M.D., Assistant Professor of Orthodontia, Harvard Dental School, Boston, Mass.*

As it has been some few years since I have reported on the progress of my researches, no doubt many members of this section have lost track of my investigation, so at the very outset I think that it might be of interest for me to give you an outline of my working theory and also to point out a few salient facts regarding my earlier experiments, so that you may trace the progress of my work.

Power of Occlusal Forces.

I suppose that everyone who has had practice in any branch of our profession realizes something about the power of the occlusal forces; and yet I hardly think that, unless you have experimented yourselves in this direction, you fully realize the extent of the power of these great forces.

When the new-born babe enters this world, the muscles of mastication are among the first group of voluntary muscles to act. Their action means life, for it is by their function that nutrition is taken in. Long before the infant can hold up its head, or has gained control over those useful organs, the hands, the muscles of mastication are highly developed and are used with great vigor.

During the act of nursing, the action of this set of muscles is so vigorous that it demands an increased blood supply, to the extent that the heart's action is greatly increased; the excessive flow of blood to these parts is indicated by a reddening of the whole head, and the fontanelles themselves are caused to pulsate so that untrained observers comment on their movement. Later, with the advent of the dental equipment, this group of muscles is given more leverage, and its action becomes conse-

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I wish to express thanks for the invaluable aid given by Prof. W. B. Cannon during these experiments, and for the use of the Physiological Laboratory of the Harvard Medical School; also to Prof. Harvey Cushing for the use of the Surgical Laboratory, and for his helpful suggestions.

quently more powerful; in fact, the force exerted on the bones of the head from the pull of these muscles during life is tremendous and amounts to many hundreds of thousands of tons of force. I have long been convinced that this great force on the skull, and the great flow of

Fig. 1 (After Cryer.) Transverse section through the human head in the molar region. Note the size of the massiter muscles and the extent to which they pull on the outer walls of the antrums and on the floors of the orbits.

arterial blood to the head caused by this muscular activity, is a powerful influence in the development of the bones of the head and the important organs incased therein. It is the object of my researches to throw some light on this important but generally overlooked subject.

As our subject is so intimately connected with the action of the muscles of mastication, it will be well to consider first a few facts pertaining to the general action of this group of muscles.

These muscles to a large extent surround the cranium, extending as they do from the temporal ridge on one side to the temporal ridge on

the other side, and the internal muscles of mastication are attached surprisingly close to the base of the brain. All this is shown in Figs. 1, 2, and 3.

It will also be observed from these illustrations that these muscles are attached to the skull and inserted into the lower jaw, at many dif-

Fig. 2 (After Cryer.) Transverse section through the human head in the region of the ascending rami of the lower jaw. Note the extent to which the muscles of mastication pull on the outer walls of the nasal cavities and the close proximity of the attachment of the temporal muscles to the brain.

ferent places and in many different ways, so that they pull in as many different directions, but it is a singular fact that, varied as are these muscles in shape, size, power and action, they have one common fulcrum, the dental equipment. The teeth may truly be termed the fulcrum of this group of muscles, because it is only when the teeth are brought together forcibly, or come in contact with food in mastication, that the great

power of these muscles is brought out. The truth of this statement can be tested by slowly bringing the teeth together. It will be noted that while the lower jaw is swinging freely, the muscular action is almost passive, but the instant the teeth are brought into action, the muscles on the sides of the head and face will be seen to knot out and contract with

Fig. 3 (After Cryer.) Transverse section through the human head further back than in Fig. 2. Note—1st, that the muscles of mastication attach to the base of the brain-case; 2nd, compare the size of this muscular mass to the brain itself; 3rd, note the outward pull on the naso-pharynx of both the external and internal pterygoid muscles.

great vigor, and, of course, the hidden powerful internal muscles do the same.

The resultant forces of these muscles are in reality the forces of occlusion, with which members of this section are so notably familiar. We well know that the forces of occlusion are based on definite laws, and it was the early recognition of these laws by us and our application of

these laws to orthodontia, that has placed our specialty in such an eminent position.

The experiments on which this paper is based and those which I have at present under way make me believe that the reaction of these

Fig. 4. Skull of Eskimo. Observe the great facial breadth due to excessive mastication. (After Hrdlicka, Am. Mus. of Nat. Hist.)

occlusal forces on the skull are based on as definite laws as are the forces of occlusion themselves; furthermore, I believe that in these reactions are locked the secrets of a normal skull; for if a group of forces acts in accordance with laws, why should not the reactions of these forces be governed by just as definite laws as are the forces themselves?

Before leaving the first three illustrations, there are several other matters worthy of consideration; for example, note the area of this muscular mass (including the tongue), as compared with the whole head.

it will be observed that it ranks well in size with the other structures or organs of this most compact, intricate and wonderful part of the human body. It is evident to me that Nature never would have devoted so much important space to this group of muscles if it were not for the benefit of

Fig. 5. Lack of growth of mandible, due to ankylosis of temporo-maxillary articulation. (After John B. Murphy, M.D.)

the head as a whole. According to the laws of evolution, the functional activity of such a mass of muscular tissue cannot but have a direct and powerful influence in shaping the bones to which they are attached. Figs. 4 and 5. (1)

Furthermore, the great supply of pure blood that the vigorous activity of these muscles demands not only rushes to these muscles, but also to other parts of the head, and it seems no more than logical to believe that the brain itself shares in this increased blood supply. The idea of

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(1) Figs. 4, and 5, are illustrations of the effect of the use and disuse of the muscles of mastication on the human skull. Fig. 4 is the skull of a Southampton Eskimo (From Am. Mus. Nat. Hist. *Anthropological Papers*, N. Y., 1910, Vol. V.) Observe the great facial breadth, with its correspondingly broad and massive mandible. A. Hrdlicka states (*"Contribution to the Anthropology of Central & Smith Sound Eskimo,"* Am. Mus. of Nat. Hist., Vol. 5, Pt. 2, *Anthropological Papers*) that their great development is typical of the Eskimo and is due primarily to the excessive mastication which their tough food requires. H. Whitney states in his work (*"Hunting with the Eskimo"*) that it is probable no other race of man has a masticatory equipment powerful enough to perform the great work necessary in the struggle for life in that barren region. Fridtjof Nansen, in his *"Eskimo Life,"* also gives a very interesting account of the excessive use of the teeth in their diet and in preparing hides for domestic purposes.

Fig. 5 shows the effect of lack of use. The exceedingly poorly developed mandible is caused by the ankylosis of the temporo-mandibular articulation. This unfortunate deformity is typical of this condition when it occurs early in life. (See *"Anthroplasty for Intra-Articular Bony and Fibrous Ankylosis of Temporo-Mandibular Articulation"* by John B. Murphy, M.D., LL.D., from the Journal of the American Medical Assoc., June 4, 1914, Vol. LXII, pp. 1783-1794.)

muscular activity and increased circulation to the adjacent parts is a well-known fact. Dr. Campbell, in his remarkable series of papers (2), laid great emphasis on this matter.

It occurred to me that if my hypotheses regarding the influence of the dental equipment on the formation of the bones of the head were correct, interference with the laws of occlusion in the lower animals

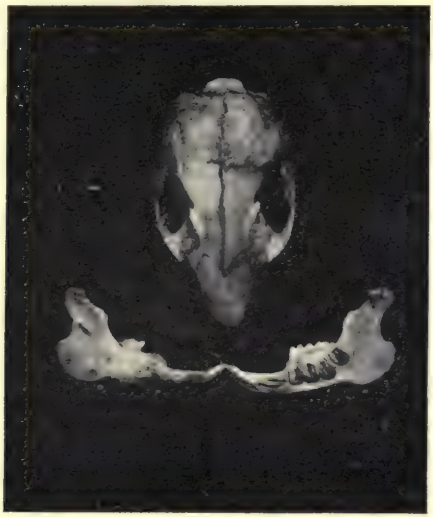


Fig. 6. Skull of a young rabbit showing the state of development at the beginning of the experiment.

would show consequent effects in the formation of the bones of the skull; and if variation occurred it might throw some light on the most complex problem of the development of the human head.

Author's Experiments.

To test this theory, the following experiment was performed:

A litter of four rabbits was selected at the age of weaning. One of the rabbits was chloroformed, and the skull procured is shown in Fig. 6. Two of the remaining animals were operated on by grinding down all the teeth on the right side of the lower jaw and the upper right central incisor. As the teeth elongated,

(2) *"Observations on Mastication," London Lancet,* July 11, 1903, "The influence of the contraction of the masticatory muscles on the local circulation of blood and lymph."

repeated grinding rendered them useless, so that all the mastication was performed on the left side. The fourth rabbit was kept in the normal state for the standard of comparison.

After seven months, the skeleton of one of the rabbits was procured

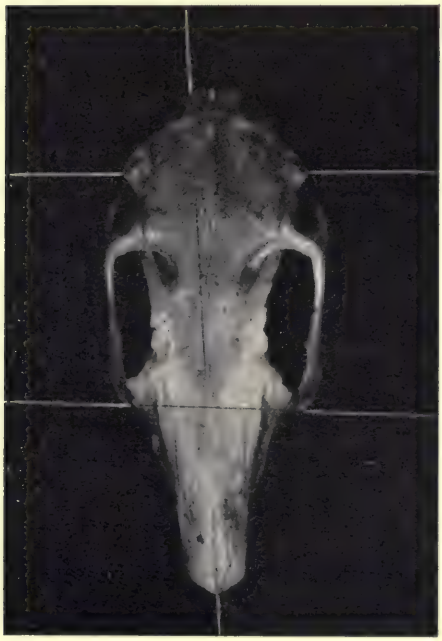


Fig. 7.

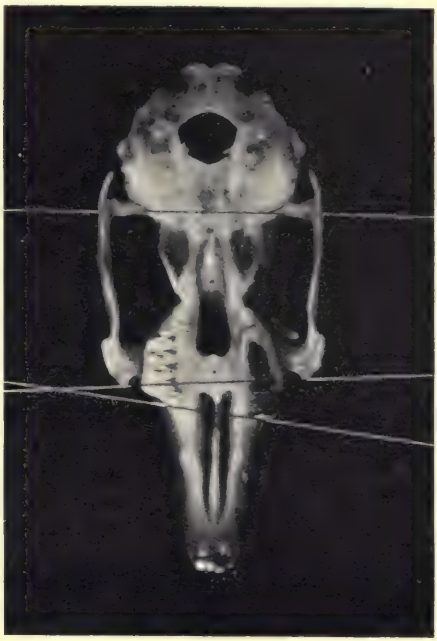


Fig. 8.

Fig. 7. The upper aspect of the skull of an operated-on rabbit. Observe the unequal development of each lateral half of the skull.

Fig. 8. Lower aspect of Fig. 7.

and the skull was found to vary, as is shown in Fig. 7, which is a photograph of its upper aspect. It will be noted by the drawn lines that there is a deviation of the bones to the left (3). The suture between the parietal and frontal bones does not run strictly at right angles to the longitudinal axis of the skull; the right frontal bone projects further forward than the left one. It will also be observed that the left zygomatic space is longer than and more advanced than the right space. The most noticeable deviation is in the nasal bones, both being twisted to the left.

(3) Right and left in this description refer to the right and left sides of the animal. (The photographs are reduced in size.)

On the lower aspect of the skull (Fig. 8) it will be seen that the deviation extends throughout the entire skull (4). The most remarkable deviation is that the anterior root of the right zygomatic arch (the zygomatic process of the maxillary bone) is retreated, while the body of the

Fig. 9.

Fig. 10.

Fig. 9. The upper aspect of the skull of a normal rabbit of the same litter. Observe the normal development of each lateral half of the skull.

Fig. 10. Lower aspect of Fig. 9.

right maxillary bone itself, with the teeth that it contains, is greatly advanced.

Figs. 11 and 12 show that the lower jaw, as might be expected, is also distorted, even to the size of the articular process of the condyle (see Fig. 11). The one on the left, or working side, is perceptibly larger than the right. (Compare with normal lower jaw, Fig. 13.)

Three weeks later, autopsies were performed upon the second altered rabbit and on the "control" animal. In dissecting out the muscles that control the movements of the lower jaw I was struck with the unequal

(4) Contrast figs. 7 and 8 with 9 and 10, which are the same views of the skull of the control animal.

muscular development of each lateral half of the altered animal. On the unused side, the muscles were noticeably atrophied and pale in color as compared with the working side. Later the skulls were weighed and both the worked-on skulls weighed much less than the normal skull, show-

Fig. 11.

Fig. 12.

Fig. 11. Lower jaw of operated-on rabbit. Note the lack of development of the condyle of the disused side.

Fig. 12. Lower aspect of Fig. 11.

ing that the interference had affected the general osseous development of the head (5).

Figs. 14 and 15 show the upper and lower aspects of the skull of the second altered rabbit. It will be noted that it varies in a similar way to the first one.

Fig. 16 shows the anterior aspect of the mandibles of the animals operated upon and the same view of the control animal. The method of interference with the occlusal equilibrium is plainly visible, and it is also evident that this interference with the equilibrium of occlusion has

(5) Weight of animals:

Control	1631 grs.
1st operated on	1478 "
2nd " "	1735 "

Weight of skulls:

Control animal	248 grs.
1st operated on	227 "
2nd " "	243 "

had its tangible influence on the equilibrium of growth of the bones. In both mandibles *a* and *c*, of the operated-on animals there is a striking similarity of deformity. In both cases the rami of the non-functioning sides are shortened, and there is even a modification in the development of the temporo-maxillary articulation on this side, as indicated by the

Fig. 13. Lower jaw of normal rabbit. Observe its perfect symmetry and contrast with Fig. 11.

shape and size of the condyle (6). In the normal case (*b*, Fig. 16) it will be noted that there was an equilibrium of growth throughout, including both rami and both condyles.

Fig. 17 shows the posterior aspect of both skulls, *a* and *c*, and reveals that the growth of those bones, far remote from the teeth, has been interfered with, as indicated by the lines passing through the junction of the superior aspect of the zygomatic processes and the sides of the braincase, as well as by a noticeable variation in the zygomatic spaces themselves. These spaces on the side operated upon are visibly much smaller

(6) The fact that the condyles were varied by the interference with the functions of the teeth coincides with a theory advanced by Dr. M. H. Cryer, in his work on the *"Internal Anatomy of the Face"* (pp. 157-159), regarding the skull of a human being in which the individual was forced to put the mandible in an abnormal position in order to masticate. The change in the occlusal forces caused a difference in the shape and size of the condyles. Owing to the lack of occlusion on one side, the markings of the origins and insertions of the muscles on that side were much less well defined than on the working side. This same condition was evident in my experiment; in fact, the condition went so far that the zygomatic processes on the non-functioning sides were perceptibly atrophied.

than on the functioning side, whereas in the normal rabbit, *b*, there is little or no difference between them. From all points of view, the overthrow of the balance of growth here indicated accords with that found in the other views of the skulls as well as in the mandibles.

The results of this experiment seem remarkable to me. Who would

Fig. 14.

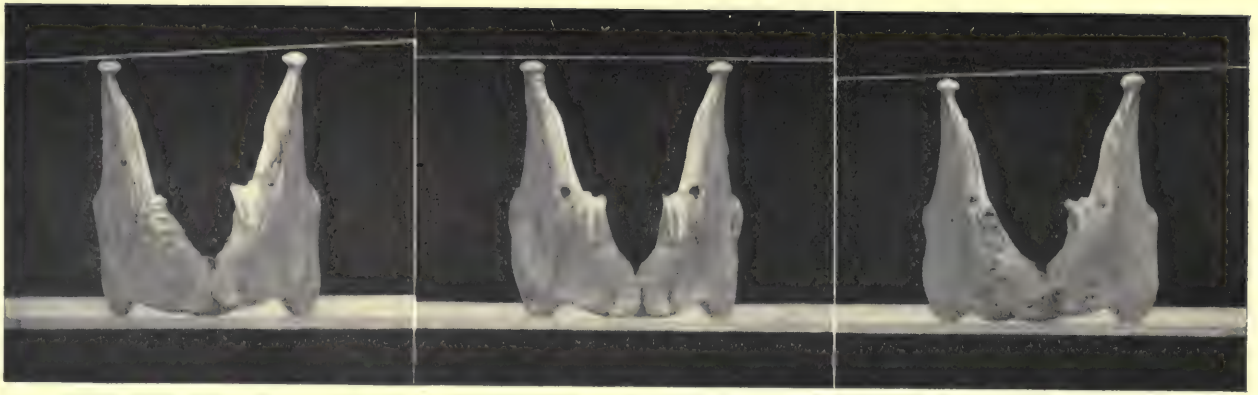
Fig. 15.

Fig. 14. Upper aspect of the skull of another operated-on rabbit of the same litter. Compare with Fig. 7 and contrast with Fig. 9.

Fig. 15. Lower aspect of Fig. 14. Compare with Fig. 8 and contrast with Fig. 10.

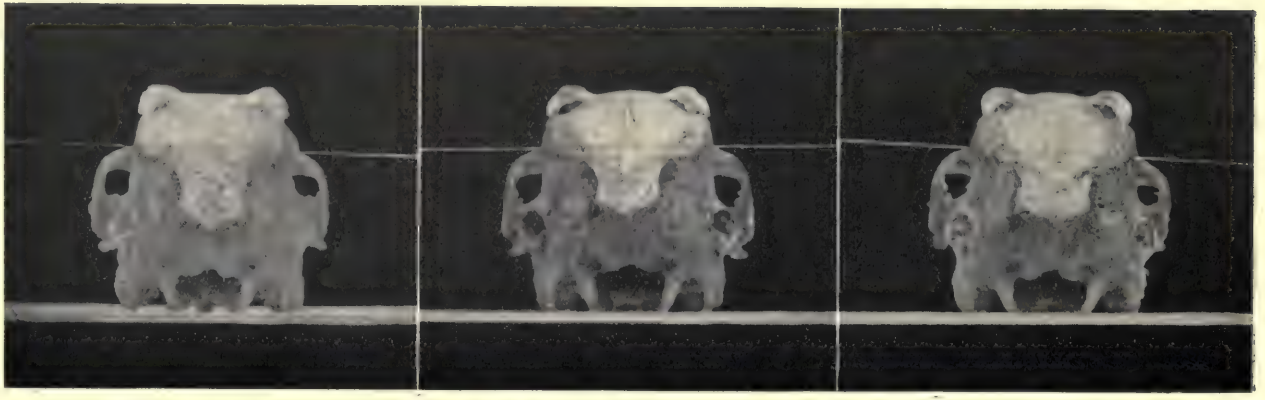
have thought that, by interfering with the laws of occlusion, the skulls would have decreased in weight, and that every suture and every bone in the head would have varied as we have seen? This experiment strongly indicates how important is the masticatory equipment of man to the development of the head, and it also brings fresh illustration of the importance of the sadly neglected temporary dentition which serves during the important development period of childhood.

The statement that the shape of the skull in the lower animals can be modified, by simply interfering with the functions of the teeth, seems



a *b* *c*

Fig. 16.



a *b* *c*

Fig. 17.

Fig. 16. Anterior views of mandibles. Observe similarity of variation of a and c and contrast with normal b.

Fig. 17. Posterior aspect of skulls. Observe similarity of variation to Fig. 16.

Fig. 18. Lateral asymmetric development of skull of sheep due to interference with the occlusal forces of the left lateral half of dental apparatus.

almost incredible. The truth of this statement can be better understood when we study further into the great power of the masticatory muscular system.

Force Required in Proper Mastication.

In the human being the force required to thoroughly masticate a lean corned-beef sandwich was estimated to amount to about three tons. Who would believe that 7,050 pounds of pressure were exerted on the bones of the skull through the medium of the teeth in masticating this simple article of food?

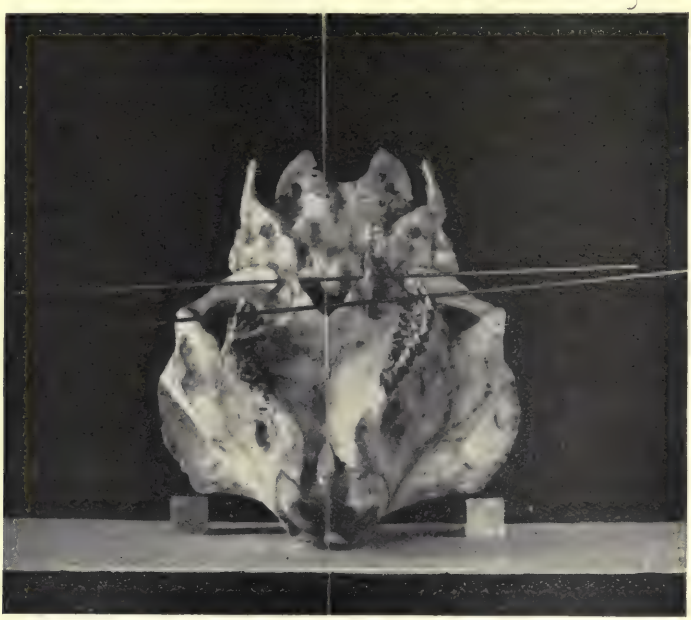


Fig. 19. Vertical asymmetric development of same.

These figures were derived from the following test:

A man with 32 teeth in good condition was selected as the test subject. The test food consisted of an ordinary lean corned-beef sandwich, 2½ inches by 3½ inches. This was masticated until it was involuntarily swallowed. The number of mouthfuls and the number of chews per mouthful, and the time consumed, were all carefully noted, the force with which the teeth were brought together was estimated to be 10 pounds for each contraction of the muscles of mastication, which is a very conservative estimate (7). The time consumed in leisurely eating

(7). The amount of force required to crush food has been very carefully studied by two investigators: Dr. G. V. Black and Dr. Joseph Head. Dr. Black confines his work to the *direct* force required to crush food (see *Dental Cosmos,* 1895, Vol. XXXVII, pp. 478-484), while Dr. Head directed his investigation towards the *trituration* of food (see *Dental Cosmos,* 1906, Vol. XLVIII, pp. 1189-

the test food was about nine minutes, and, as has been stated, the estimated force was 7,050 pounds. A second person in making a similar test required 52 contractions less than the former, but the meet was much more tender than in the first case.

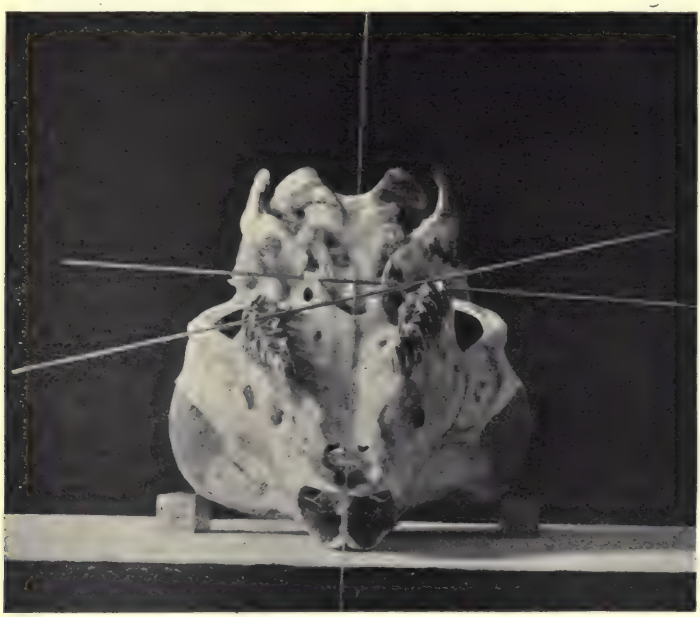


Fig. 20. Vertical asymmetric development of sheep No. 2, due to interference of only the lower right teeth. (Contrast with Fig. 19.)

If these deductions are at all accurate, the force exerted on the skull through the medium of the teeth over a period of time can be easily calculated, and will be found to be enormous Thus we readily see how interfering with one side of the dental equipment in an animal can affect

1192). Both of these experiments were more to determine the crushing point of food than the amount of force required to masticate food; so, to estimate the force required to masticate a given article of food, the number of closures of the jaws must be considered.

The following table shows the comparative results of these two investigations in crushing meat. It will be noted that the trituration gives a lower crushing force, with one exception, than the direct pressure:

	Dr. Head lbs.	Dr. Black lbs.
Corned beef	18-22	30-35
Tenderloin of beefsteak, very tender	8- 9	35-40
Round of beefsteak, tough	38-42	60-80
Roast beef	20-35	35-50
Boiled ham	10-14	40-60
Pork chops	25-30	20-25
Roast veal	16	35-40

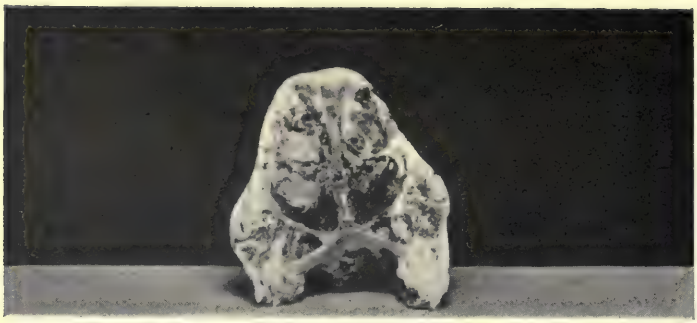


Fig. 21. Section of skull No. 2.

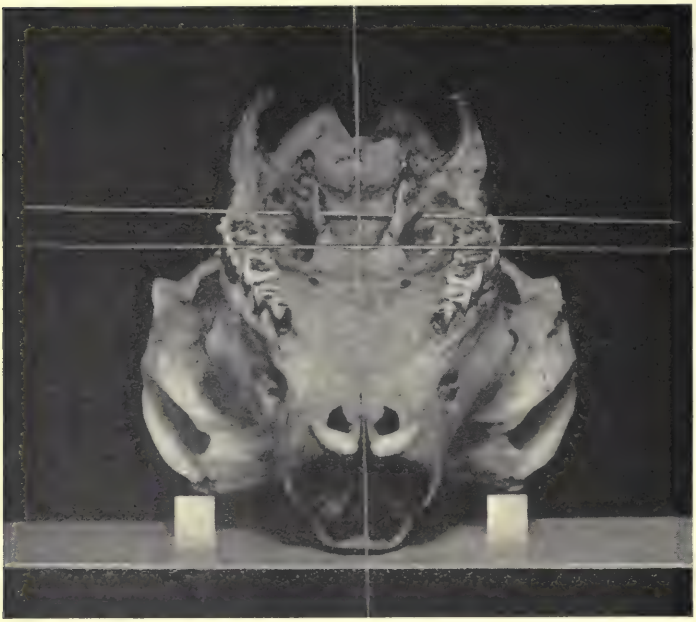


Fig. 22. Normal growth of control sheep.

the shape and structure of the skull, for, according to the laws of evolution, we know that the continuous muscular force exerted on a given bone determines the shape of that bone (8).

(8) Dr. Richard Landsberger of Berlin, Germany, in investigating the influence of the eruption of the teeth in the development of the maxillary bones and nasal cavities, removed from very young dogs one lateral half of the dental apparatus and found that not only was the growth of the maxillary bones and nasal cavities affected, but much to his surprise, found that the removal of the teeth had brought about an asymmetric development of the entire skull. See *"Der Einfluss der Zähne auf die Entwicklung des Schädels"* von Dr. Richard Landsberger, Berlin,

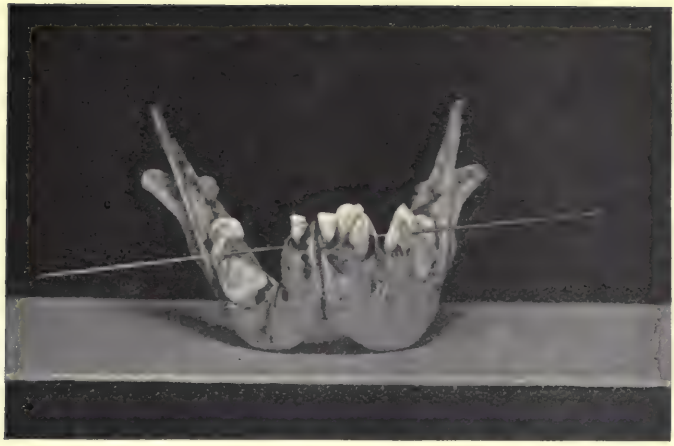


Fig. 23. Anterior view of mandible of dog, showing lack of development due to interference with occlusal forces of the right lower teeth.

Author's Experiments with Sheep.

I now wish to report on my experiments with another type of herbivorous animal, the sheep (9). For this experiment two animals of the same birth were selected for the test, and for the control I procured their mother. In the first animal I eliminated, as best I could, the function of the left lateral half of the dental apparatus by cutting off both the upper and lower teeth on that side. In the second animal, the function of the right lateral half was interfered with by cutting off only the lower teeth on that side. After seven months the skulls were procured and the next series of illustrations shows the state of growth.

Fig. 18 is from a photograph of the lower aspect of the skull of animal No. 1. The drawn line extending along the sutures of the palate passes markedly to the left of the centre of the foramen magnum. This shows an asymmetric growth of the skull which corresponds in a striking manner to that observed in the rabbit experiment, but, of course, here it

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ein Vortrag gehalten auf der Versammlung der Physiologischen in Berlin, December 11, 1911. Archiv Für Anatomie und Physiologie 1912.

Compare with my "*Preliminary Study of the Influence of the Forces of Occlusion on the Development of the Bones of the Skull.*" Read before the American Society of Orthodontists at Denver, Colo., July 13, 1910, and published in the ITEMS OF INTEREST, February, 1911. Vol. XXXIII, No. 2.

(9) Owing to the fact that after the operation the animals did not thrive in confinement, they were sent to the country for board, where it was impossible to have them under as close observation as they should have been, and, unfortunately, during this time, the posterior molars erupted and were functionating, so that the outcome of the experiment was interfered with. Nevertheless, the results are worthy of note.

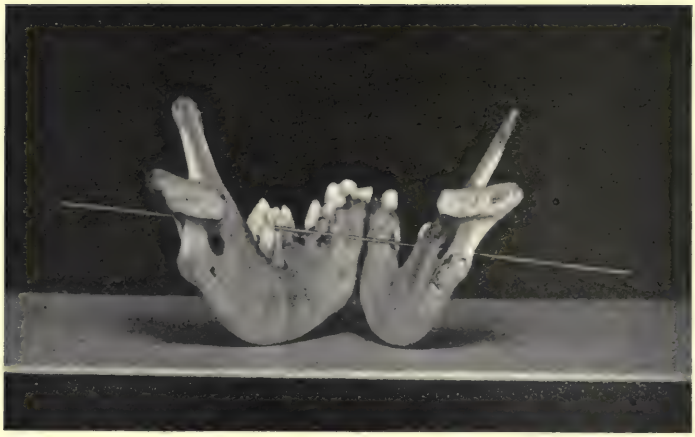


Fig. 24. Posterior view of Fig. 23.

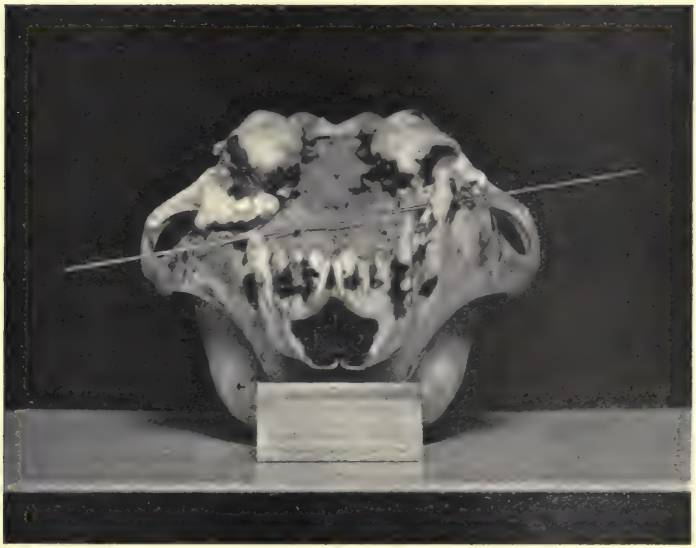


Fig. 25. Skull of same dog. Observe the vertical distortion.

is toward the opposite side, for in this instance the left lateral half of the dental apparatus is interfered with, while with the rabbits the right lateral half was operated on.

Not only was the growth of the skull distorted in the lateral plane, but, as shown in Fig. 19, there was also a vertical distortion as well. The vertical measurements were made with long steel wire pins, one

resting on corresponding depressions of the articular surfaces of the glenoid fossæ, the other pin resting on the corresponding depressions of the corresponding molars. The latter points I consider as accurate as could be obtained, for, as stated in foot-note 9, the posterior molars erupted during the experiment and their function was not interfered with.

Fig. 20 is of the skull of the animal No. 2, and corresponds to Fig. 19 of animal No. 1. It will be remembered that in this case the interference was confined to the lower teeth of the right side and that the upper teeth were not interfered with during the experiment. Here it is observed that the non-functioning teeth, with their alveolar process, have elongated to a marked degree, and that the skull in the region of the temporo-maxillary articulation is twisted in the opposite direction, as indicated by the steel wire resting in the glenoid fossæ. This vertical twist of this part of the skull corresponds well with that in animal No. 1, but, of course, in the opposite direction, because of the interference with the opposite side.

There is in this experiment one fact which I cannot account for, and that is, in animal No. 2 there is very little lateral twisting of the anterior part of the skull, while in animal No. 1 it is quite marked. I now realize that it would have been better had I interfered with both animals in the same way, as I did in my rabbit experiment.

Fig. 21 is a section through the third molar region of animal No. 2. Here, again, the vertical distortion is plainly visible. This view, furthermore, shows that there has been an arrest in the development of the palate in both breadth and thickness of the right or non-functionating side. This lack of growth is not confined to the palate alone, for the breadth of the entire right lateral half is less than that of the left or working side. The observer can test this himself by measuring from the nasal septum to the external surface of the bones. Fig. 22 is of the control and shows normal development.

Experiment on a Dog.

I now present for your consideration a partial report of an experiment on a dog. I greatly regret that this report is not complete; the incompleteness is owing to the fact that, in spite of the best of care, the entire litter, including the control, died before the prescribed termination of the experiment.

In this particular animal (Figs. 23-24) I interfered with the functions of the lower teeth on the right side. After four months and fourteen days from date of operation, the skull was obtained and the following illustration shows the state of growth. Figs. 23 and 24 are of the

mandible. It will be observed that among other changes in the body of the bone, the condyle of the non-working side is less well-developed than

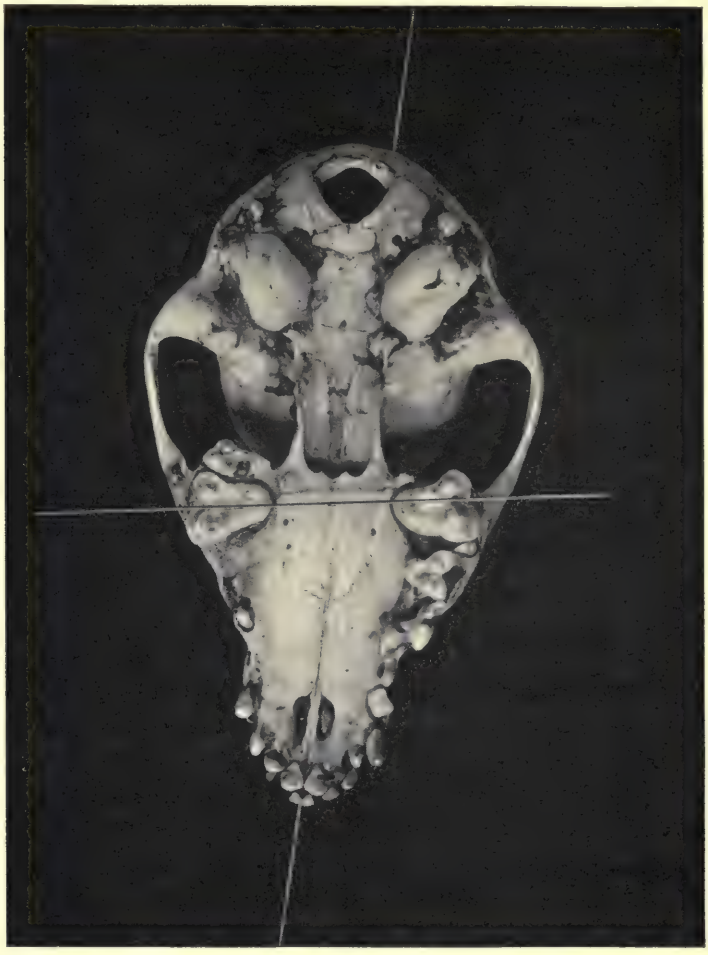


Fig. 26. Same, lower aspect. Observe the lateral twist of anterior part of skull.

that of the non-interfered-with side. (Compare with Fig. 16, rabbit experiment.)

To me it seems remarkable that there should be such a bony change in so short a time, especially as during this period the posterior molars erupted and were functionating. (The condition of the animal prevented etherization and no second interference was attempted.)

Fig. 25 is an anterior view of the skull, and here a vertical distortion is manifest. Fig. 26 is of the lower aspect. The line drawn along the inter-maxillary suture passes to the right of the foramen magnum, showing that the anterior part of the skull had already begun to deviate.

Conclusions. In conclusion, I wish to state that, although I have been working at this problem for a number of years, it has progressed very slowly, due largely to the fact that each experiment extends over so long a period of time, and also because it is a very difficult matter to completely eliminate the functions from one lateral half of the dental apparatus. The persistency with which Nature adapts the occlusion of the interfered-with teeth for use is remarkable and strongly points out the importance of the dental apparatus in the scheme of life.

I fully realize that a hostile observer could criticize this work, as far as I have carried it, as being incomplete; but those who are familiar with the biology of bone growth and who appreciate that muscular activity, blood supply and cellular activity are all bound together in bone development, will, I think, appreciate the significance of this line of investigation, and will perceive its importance in the development of the bones of the head and the organs incased therein.

The fact that my investigations are perhaps another reason for making the general practitioner appreciate the far-reaching influence of preserving the temporary dentition which serves during the important developmental period of childhood; and also that orthodontists are referring to it as a plea for the establishment of the occlusal equilibrium early in life, stimulates me to carry still further this slow and patient work.

The Use of the Angle-Young Lock and Auxiliary Wires in Conjunction with the New Angle Appliance.

By Alfred P. Rogers, D.D.S., Boston, Mass.

In considering the treatment of malocclusion the first requisite is, of course, a correct diagnosis, but this is of very little value if the operator is unable to plan and construct an efficient appliance to meet the requirements. Therefore, careful thought following the dictates of the diagnosis must be given to the method which is to be employed.

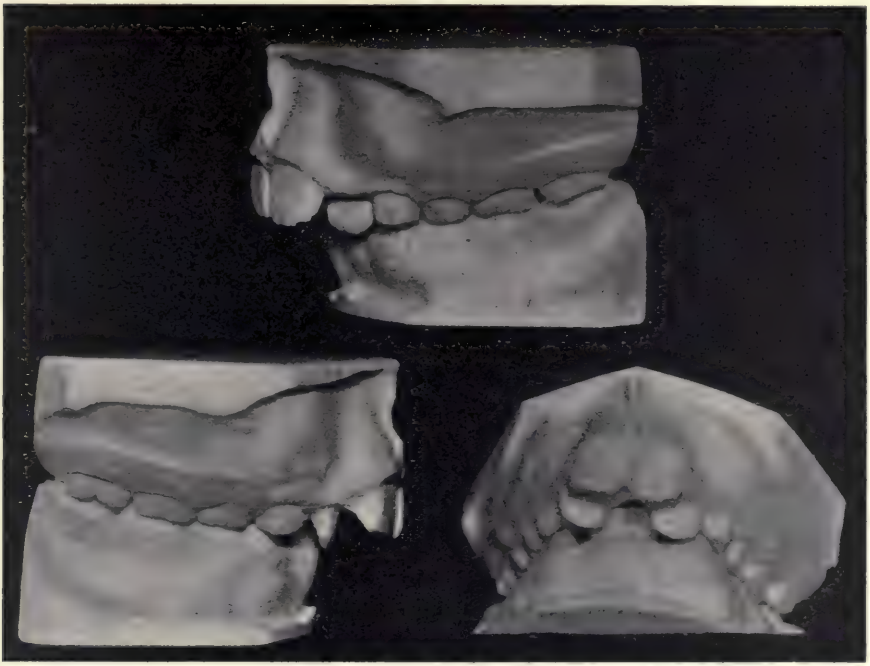
At the present time there are many methods which are supposed to accomplish good results. The operator, unless he has made a thorough study of these methods, is sometimes at a loss to differentiate between their degrees of proficiency, for there is such a great difference between ignorance and enlightenment in this day of rapid progress that one needs to think well and work diligently to keep abreast with the constructive art of orthodontia. All mechanical triumphs are the result of mental effort and the latest worthy contributions to orthodontia show most clearly the result of active and accurate thinking on the part of the leaders.

Lack of Development.

In the diagnosis of malocclusion there is one condition which is so frequently present that it seems almost a constant factor. This condition is manifested by an insufficient development of the bony tissue for the accommodation of the erupting teeth. Its frequency has stimulated the inventive orthodontist in his efforts to combat it. The result is, that it is now possible to construct appliances competent enough to stimulate bone growth in any segment or section of the arch which the operator may desire.

In recent years there have been many and various attempts to construct an appliance to meet these requirements, but the real refinement in this particular field was not reached until Dr. Angle, a few years ago, produced the appliance known as the "New Angle Appliance." It has been found that with the skilful use of this appliance, unusual efficiency in root movement and bone stimulation may be developed. Its useful-

ness in many cases, however, has been greatly enhanced by the employment of that ingenious molar locking device invented jointly by Dr. Angle and Dr. J. Lowe Young, and known as the Angle-Young Lock. The facility with which various root movements in the molars as well as



Figs. 1, 2 and 3.

all other teeth in the dental arch have been affected by the use of the lock in conjunction with the vertical pins and base wire is truly remarkable.

The purpose of this article is to explain, in as brief a manner as possible, the working of this combination, showing the efficient manner in which it produces bone stimulation when following the cardinal principle involved in its construction, which is, stated briefly, gentle and prolonged stimulation through the medium of the roots of the teeth which have become part of the appliance itself by reason of the firm and accurate application of the various parts of the appliance.

History of a Case from Practice.

For the purpose of illustrating the results obtained by this appliance I will present a severe case of malocclusion found in a child nine years of age. (Figs. 1, 2 and 3). This case revealed many discouraging features, and had it been necessary to

resort to the arch wire and ligatures it would have been most trying to both operator and child. Very careful thought was given to the selection and construction of the appliance designed to carry out this work. The fact had to be taken into consideration that the child would be away

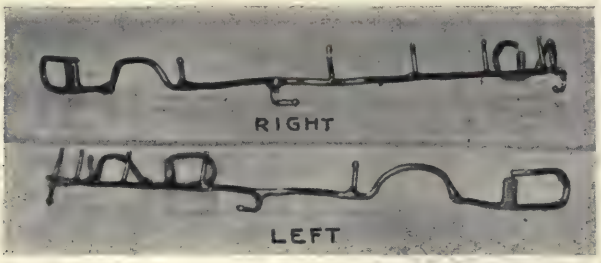


Fig. 4.

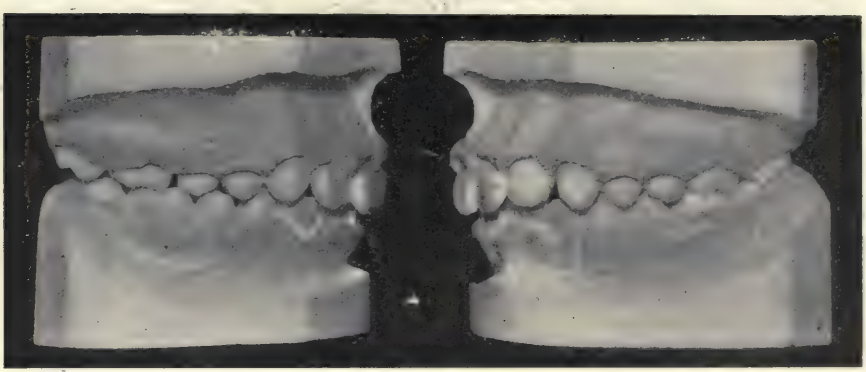


Fig. 5. Fig. 6.

from the operator for long periods of time. Three things were essential: First, gentle and persistent pressure that would be capable of accomplishing results. Second, an appliance that would remain adjusted without frequent visits; and third, one that would give the greatest protection to the teeth themselves.

The operator could conceive of no better combination than the Angle-Young Lock in union with the base wire and vertical pins as shown in Fig. 4. In this case the buccal loops were made sufficiently large to furnish prolonged gentle stimulation, and were found to be admirably adapted for the requirements exacted of them. None of the difficulties which are sometimes experienced when the nut and screw appliance is used were encountered. By expanding the loop very conser-

Fig. 7.

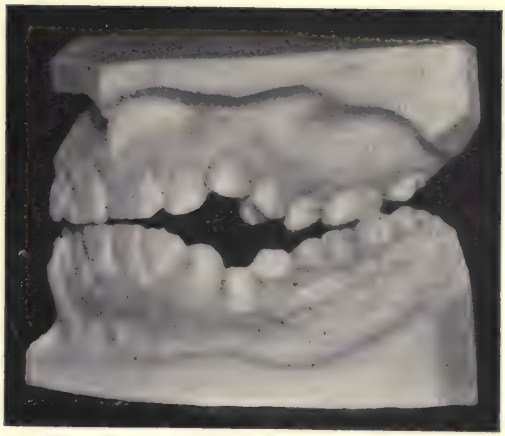


Fig. 8.

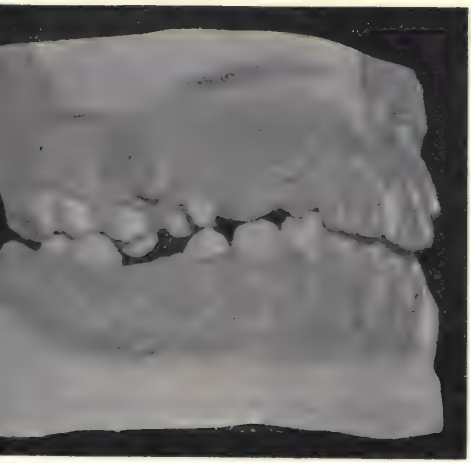


Fig. 9.

Fig. 10.

vatively, stimulation seemed to follow naturally and satisfactorily. Some criticisms have been made of this combination, especially the loop and locking device, but such criticisms must certainly have been based upon the critics' own failures, probably through fautly application, or from some theoretical consideration not supported by actual practice. For, if an appliance of this kind appears to be ideal in the hands of a few, when applied to favorable cases, it is very easy to discern where the trouble lies when it meets with condemnation. The loops, in this instance, were made large and flexible, and when it was necessary to em-

ploy these forces the expansion was made very light, probably not more than 3/100 of an inch upon each adjustment. Always upon the removal and readjustment of the appliance very accurate measurements were taken. The stimulation of the anterior parts when desired was accomplished in the usual way of bending the wire. For the control of the erupting bicuspids and cuspids it was sometimes necessary to make temporary attachments of flexible wire.

Figs. 5 and 6 show the right and left views of the same case still incomplete, but during the last stages of its development. Your attention is called particularly to the normal position of the anchorage teeth showing no tipping nor abnormal position in spite of the enormous bone growth and unusual readjustment of the teeth and jaws. The intermaxillary elastics used in this instance were of the lightest variety, and at no time did the patient suffer even discomfort.

Fig. 7 shows but one of many forms which may be employed in the use of the flexible wire referred to. The vertical pin is capable of being inserted into the labial tube attachment of any tooth whose position needs attention, and extremely gentle treatment is hereby assured. The solder joint may be attached to the base wire at any point which seems convenient for the particular case in hand. It has been used successfully in elevating the lower bicuspids as illustrated in Fig. 8; and has also been used to place in normal position cuspids erupting between the bicuspids illustrated in Fig. 9. The loop makes this wire extremely flexible and gives a very free and comprehensive scope of action and should always be a part of the flexible wire.

Fig. 10 shows the present condition of the case illustrated in Fig. 9 and demonstrates unusual amount of the root movement that was necessary to place this cuspid in its natural position.

Papers Presented in Section VIII.

Operative Dentistry.

Electricity as an Aid to Oral Diagnosis.

By Arthur C. Wherry, D.D.S., Salt Lake City, Utah.

In the selection of this subject for your consideration I do not presume to come before this assemblage as one especially qualified to present so great a topic, but rather to endeavor to create in the minds of the average practitioner a realization of his possibilities to honor himself and his profession by bringing into daily practice a greater resourcefulness in his services to humanity.

With the advent of modern surgery the field of diagnosis assumed a broader sphere and our medical brethren have come to realize that not always were they justified to make a positive diagnosis upon a question involving a human life by purely physical symptoms and so the field for Roentgenology or X-ray developed into far greater importance than it had ever assumed as a therapeutic agent.

Dentistry as a profession has expanded in other directions more rapidly, perhaps I may say, than any other profession, but I fear many of us do not assume to take our field of usefulness to heart and exert our greatest influences for the alleviation of humanity's sufferings.

In his efforts for thorough diagnosis a physician requires urine analysis, a blood count, sputum examination, test meals for chemical and Roentgen examination, pulse and respiration counts, blood pressure and what not, and little does he hesitate to request and demand the fulfilment of all his needs. Is it so with us many times? I believe not. We ask a few questions, inject a little hot or cold water, press our fingers here and there and say, "Well, I can't say positively, but I believe it is so and so."

Our men who have claimed for themselves positions of national importance have grasped these essentials and by their aid, used as a ladder, have ascended to positions of preeminence where we of rank and file are content to gaze at them with open-mouthed admiration, while the opportunity is with us to emulate their example and excel their accomplishments, because we are favored by a knowledge of their experiences.

The one agent that, to my mind, is most overlooked by us in our daily

practice is electricity. No man has been able to explain what it is, but we know that in the commercial world it is fast entering every avenue of activity. In the therapeutic branch of medicine and dentistry its use is well recognized and commonly applied, with results to gratify the most exacting and it is because of the lack of authentic dental literature on this important subject and in the hope that we may here collect new ideas from many different individuals on its various practical uses and thus cause it to become a greater agent and aid in oral diagnosis that I have selected this subject.

The measure of success in the practice of any branch of the healing art to-day, far more than in the past, is governed by the ability of the operator to correctly diagnose pathological conditions coming under his care. It is not enough that we can insert a perfect filling or construct a good piece of prosthetic work; we must be able to determine by deduction what lies buried in the human head and especially the oral cavity.

In the present age of commercial activities there is a tendency on our part to permit the manufacturer of electrical apparatus to think for us without giving enough consideration to practical results of equipment and in the consideration of this subject I am not making a plea for elaborate equipment, but rather for serviceable electrical appliances, with simplicity enough to make them practical for use and so arranged as to lend dignity and respect to your office furnishings, thus combining wisdom and strength into useful beauty.

In their order of daily use it is hard to determine what part of the electrical field comes in for the greatest use and I will, therefore, consider the simpler ones first.

Lamps.

I believe the mouth lamps and the illuminating and transilluminating effects go far towards simplifying many perplexing daily questions of diagnosis and should be given very careful use before resorting to more heroic measures for determining trouble. Many times, by means of their use it is possible to determine approximately what teeth are non-vital and which have had root fillings inserted, and sometimes a very good idea may be had as to the thoroughness of this operation, especially in anterior teeth. This is of special value in cases of putrescence of pulps of sound teeth, such as all find, with symptoms pointing to innocent teeth, and often possesses great value in convincing the patient of your ability to thoroughly care for his aches and pains.

In sinus diagnosis also does the transilluminating effect of the antrum lamp greatly aid by placing before the operator and patient both, a very real picture of the affected region with all the vivid shadings of a first

class radiograph and with the advantage of being able to vary the angle of inspection at will. The operator is able to make frequent observations and keep careful watch of developmental changes of the affected area.

In suspected and unsuspected cases of empyema of the antrum, the use of the antrum lamp often simplifies our trouble by showing a clear field and saves the need of a radiograph.

In other cases a shady portion revealed by the early application of the ray indicates an absolute need of determining whether we are confronted by a benign cyst, dentigerous cyst, polypoid growth or acute suppuration, and then many times it greatly aids in properly reading our radiograph and in determining what our pathological condition is.

In neurasthenic patients suffering with their various hallucinations, whether they be mental or alcoholic or what not, the operator is soon able to make his scientific calculation and deductions and, at the same time, properly impress the sufferer with his thoroughness of skill and understanding and greatly aid in handling this very unsatisfactory class of patients.

The use of the mouth lamp in case of general examination for illumination of the oral cavity and its value in showing cavities, tartar, mucous patches and various conditions so frequently found at the gingival margin, is I believe very generally neglected or not realized and I urge you to watch and see in how many ways the mouth lamp will aid in your work. These lamps have a neglected field of usefulness for inspecting the area and locating fragments of roots which have been left buried in the jaw where the thickness of the tissues do not preclude the penetrating rays of light from performing their function.

Galvanic Cautery.

The cautery has some value in the field of diagnosis, such as securing specimens where a malignant growth is suspected and the aid of a pathologist or bacteriologist is desired.

It is also a safe and quick way of destroying spongy gum tissue often found protruding into cervical cavities, thus obstructing a free field for observation as to extensiveness of destruction, without the inconveniences of excessive hemmorhage or the pain usually occasioned by the use of the lance.

X-rays.

In consideration of the next agent, the X-ray or Roentgen examination, I come to what I believe is the most neglected aid to oral diagnosis in the entire world. I do not think we have in the large percentage of dental offices made one-tenth the use of this valuable science that humanity demands of us, and the day is not far distant when the public will not only expect

more, but will absolutely require that we apply thorough, constant and skilful use of this aid to solve pathological conditions.

In my consideration of this, under the classification of electricity, I am not unaware of the fact that I may be called to account for confusing a certain ray with the general subject of my discussion, but I believe for the sake of arriving at a safe and sane manner of diagnosis this little technicality will be overlooked.

Before going into the discussion of this branch of diagnosis, permit me to say that I do not think it necessary that a dentist be a Roentgenologist or radiographer in the sense of being his own operator. In fact, I believe in many or in a large majority of operators' hands it is a big mistake to rely on radiographs made by inferior machines, when it is possible to secure the services of a specialist, with equipment such as none but one devoting much time and study to X-ray work, would possess.

However, in locations where it is impossible to secure the services of a specialist, anyone with a small machine and a limited amount of study and experience, may soon become proficient enough to greatly help himself with the aid of a local photographer.

To secure a good plate is essential and we should never content ourselves with anything short of one approximating perfectly clear outlines, with clear shading. And when we have secured this, then our greatest responsibility begins.

To interpret pathology in a radiograph is not always as easy a matter as observing features in a photograph, although it is equally as essential that we be able to do so, and that we should be prepared to study our plate or film and recognize any feature that indicates an abnormal spot or condition, after which we must determine whether we are facing a consideration of the trouble we are looking for or not. This is a feature of the practice that no one can tell you how to do, nor do for you. It requires practical experience and study combined with a reasoning intellect and the application of an abundance of common sense.

It is not my intention to attempt to tell you in what types of cases to use the Roentgen examination. Your own troubles must tell you when you don't know all you want to regarding a case and then it becomes necessary to determine whether the use of this method of photographing the internal parts, will give you any light towards a positive diagnosis.

There can be no doubt but that we are required to make use of it in all cases where pain exists from obscure causes which we are unable to determine. In cases where glandular trouble points to a focus of infection which is presumed to be located in the oral region and not subject to location by other means at our command. Again with the interlocking of de-

ciduous teeth with their permanent successors, we often need to determine the progress of development and when extraction may be required; and in cases requiring the services of the orthodontist the movement of the teeth should be verified by frequent radiographs. When we have cases of simple pericementitis failing to respond to the ordinary types of treatment and extending over a period of time, we can often save our patient much severe suffering by early application of this form of examination, thus revealing the particular root that is causing the irritation and as a rule the cause of the trouble is made apparent without further delay.

In many cases it is easy to settle the question as to whether it is possible to devitalize molars for crowns, either for individual use or bridge abutments, by showing the shapes of roots and pulp chamber, thus insuring more conservative results in many cases.

In chronic alveolar abscess work the value is so positive that it is hard to understand why we should not make the practice almost universal and if we would do so many cases of systemic infections, not attributed to any definite cause, would be eliminated and I believe that many human lives would be spared for years. This applies also to deep seated pyorrhea pockets that have, in my judgment, so materially assisted in incapacitating humanity with rheumatism, appendicitis, liver infections, endocarditis, etc., and were we regularly to locate by this means every hidden remnant of a root that is causing systemic trouble our mission in life would not have been in vain.

It is claimed by some operators that the use of the X-ray permits the detection of pulp nodules and secondary dentin formation which are causing distress, and this is also true in part, but in my observations and experience I fear we should not place too much dependence in the absolute reliability of radiographs in this class of cases. However, it affords much assistance in many cases and should be given serious consideration in all suspected cases, and in many instances we find other contributing causes which had been unsuspected.

It is very necessary in the majority of cases of persistent suppuration before operative procedure to determine the extensiveness of the destruction and find out if there are any secondary pockets or fistulous tracts and also to make sure where any foreign objects may be located and ascertain as near as possible their size, and I know of no other safe method of acquiring this information except the use of the radiographs.

Another class of cases which early calls for the assistance of the Roentgen ray is the antrum case with or without the involvement of either the frontal or ethmoid sinus and, even though we are reasonably secure in our diagnosis of the antrum condition itself by other methods,

we can never safely estimate the condition of the frontal or ethmoid sinus unless we have a perfectly clear radiograph and, in addition to its aid in determining our pathology, it also assists in determining our prognosis by telling the lowest point for drainage and something of the extensiveness of involvement as well as clearly showing the anatomical relations of the several sinuses.

In conclusion, I would urge the regular practice of the use of your electrical equipment in every case where a doubt exists in your mind after an examination by observation and symptoms has failed to produce a positive diagnosis and even then in many instances we may save ourselves from censure and discredit where results have not been satisfactory if we have taken the precaution to verify each symptom and have retained evidence of our thoroughness in the form of radiographs or the admitted observation by means of illumination or transillumination.

To be sure we are right is satisfying to our conscience; to make others have confidence in our rightness is the one great-stepping stone to success and as rapidly as we inject thoroughness into the daily practice of our profession at large, will the medical world and humanity in general, credit us with the entire fulfilment of our life's mission.

Peridental Anesthesia—Intra-osseous Method.

By Frank L. Platt, D.D.S., San Francisco, Cal.

From a more or less obscure origin, antedating perhaps the building of the pyramids, dentistry, passing through various vicissitudes out of the hands of strange pagan priesthoods, the darkness and superstition of the middle ages and the narrow empiricism of its more recent history into the present age of scientific research and practical application of established principles, has steadily contributed in no small degree to the comfort, health and happiness of the world. Of all its gifts to humanity, however, one, anesthesia, stands out alone, pre-eminent, immeasurable, incomparable.

When, on December 11, 1844, Dr. Horace Wells discovered the anesthetic property of nitrous oxid, he probably little realized the vast significance of his discovery, or that he had been the leading actor in one of those rare events which from their peculiar nature can happen only once in the whole history of humanity. Of the great importance of this discovery it is not necessary to speak in this paper; it would be as difficult to do the subject justice as to enumerate the thousands of lives which have been saved and the countless hours of suffering which have been avoided through the influence of anesthesia.

Science has bestowed no greater gift upon humanity, yet it is a peculiar fact that while dentistry gave anesthesia to the world, it is only within very recent years that, aside from the extraction of teeth, it has been successfully applied for the relief of pain during other dental operations.

To-day nitrous oxid is used extensively and successfully for this purpose, and local anesthetics, the use and development of which are largely due to the researches and experiments of dentists, also have won a firmly established place in dental practice. Local anesthetics, properly employed, will banish forever the universal dread of dental operations, render it possible for the operator to do more perfect work and lessen very materially the general neglect of the teeth due very largely to the fear of pain. It is the purpose of this paper to call your attention to the

intra-osseous injection of anesthetics, one of the methods which may be employed for the prevention of pain in every dental operation from the extraction of an impacted third molar to the removal of a pulp or the excavation of a cavity of decay.

Dental Anatomy.

That we may have a clear understanding of our subject let us first briefly study the anatomy of the structures involved in our operations.

The teeth are placed in the alveolar processes of the mandible and maxillæ and depend for their innervation on nerves derived from branches of the fifth cranial nerve, the upper teeth being supplied by branches from the superior maxillary nerve, and the lower teeth by branches from the inferior maxillary or mandibular nerve.

The superior maxillary nerve supplies the upper teeth through three branches, the posterior superior, middle superior and anterior superior dental nerves.

The posterior superior dental branch of the superior maxillary nerve supplies the molar teeth and forms a plexus with the middle superior dental branch which gives off filaments supplying the bicuspid teeth. The anterior superior dental nerve forms a plexus with both the other superior dental nerves and gives off branches supplying the incisor and cuspid teeth.

The inferior dental nerve on either side enters the body of the mandible by way of the inferior dental foramen, where it enters the inferior dental canal and emerges from the bone at the mental foramen. Between these two foramina the nerve gives off a series of branches which form a plexus within the bone and supply the molar and bicuspid teeth.

At the mental foramen the nerve divides into two branches, the incisive and mental, the former supplying the incisor and cuspid teeth. If we bear in mind the fact that the nerves supplying the teeth are all filaments from plexuses encased in the cancellated tissue of the alveolar processes it must be apparent that a local anesthetic brought into contact with a portion of a plexus will anesthetize the nerves of the peridental membranes and teeth most intimately associated with that plexus.

The alveolar process of each superior maxillary bone extends from the tuberosity behind to the median line in front, where it articulates with its fellow of the opposite side.

It is a rather thin rim of bone in which the roots of the teeth are firmly imbedded, and consists of an outer and an inner plate connected by numerous septa of cancellated bone, these septa and the outer and inner plates forming the walls of the alveoli in which the roots of the teeth are placed.

The outer plate is thin and frail and frequently marked with ridges indicating the position of the roots of the teeth beneath it. The inner plate, heavier and stronger than the outer, varies in depth in different individuals and is continuous with the bones forming the hard palate.

The alveolar process of the mandible is similar to that of the maxillæ, excepting that the outer and inner plates are of about equal thickness. In some cases, however, the buccal portion of the outer plate is heavier than the inner.

The body of the process is composed of cancellated bone containing the alveoli for the reception of the roots of the lower teeth.

Appliances Needed for Anesthetizing.

The equipment necessary for the production of intra-osseous anesthesia consists of an all-metal hypodermic syringe, free from unclean and unsterilizable leather or fiber washers, which may be quickly taken apart for sterilization and quickly assembled; a glass graduate and mixing rod; a small porcelain dish in which the anesthetic or needles may be boiled; both hand and engine drills for penetrating the outer plate of the alveolar process when necessary, and two styles of needles.

The hypodermic needles used should be of twenty-eight gauge, and the part projecting beyond the point of reinforcement should be not more than three millimeters long and ground to a bevel of fifty-two degrees.

Conical needles, one straight and one curved, are also necessary for use when the process has been penetrated by the drill. These needles should taper gradually to a fine point and should have a bore about equal to that of the twenty-eight gauge hypodermic needle.

Technique for Intra-osseous Anesthesia.

The technique of intra-osseous anesthesia is not difficult to acquire, but experience alone will make one thoroughly proficient in the art.

The patient should be seated in the operating chair in such a position as will be comfortable for him, at the same time bringing the part to be operated upon into a position of easy accessibility for the operator.

The entire oral cavity should be thoroughly cleansed with an antiseptic solution directed upon the tissues by means of an atomizer under thirty-five or forty pounds pressure, particular attention being given to the gingival borders and interdental spaces of the part to be anesthetized.

Cotton rolls and napkins and the saliva pump to protect from the saliva the part where the injection is to be made are necessary. The point where the injection is to be made, being thus protected, should be

thoroughly scrubbed with a pledget of cotton or a short section of a small cotton roll dipped in the antiseptic solution used in the atomizer and then painted with aconite and iodin. Some operators prefer to touch the point where the needle is to be inserted with the point of a small applicator dipped in tri-cresol or carbolic acid.

In very unclean or pyorrheal mouths, perhaps all three of these steps toward cleanliness may be employed to advantage.

It is hoped that it is entirely unnecessary to remind the members of this section that the syringe, needles and all instruments used in the operation must be sterilized, preferably by boiling. Two methods of reaching the cancellous tissue of the process may be employed, driving the needle through the outer plate of bone or drilling through it with a hand drill or a small bur in the direct or angle engine hand piece, the hand drill being preferable where it can be used, as it does not heat and is less apt to wound the periosteum.

In the majority of cases the former method is entirely successful and is accomplished as follows: Pressure with the finger is made at the point of injection and the needle gently inserted into the tissue blanched by the pressure, beginning to inject the anesthetic as soon as the needle touches the tissue, for to produce local anesthesia without pain the anesthetic should always be kept ahead of the needle. Two or three drops of the anesthetic having been injected into the gum, the needle may be driven through the outer plate of bone by light blows struck upon the piston head of the syringe with a very light mallet or the handle of an instrument. After two or three blows have been struck, pressure should be made with the hand in the usual way and the tapping and pressure alternated until the cancellous tissue is reached, when a sufficient quantity of anesthetic may be injected very slowly and with little pressure. Should the needle become clogged during the process it should be withdrawn and the obstruction removed from the needle with heavy blows struck upon the piston head.

The needle should then be reinserted in the original puncture and the process repeated until the cancellous tissue is reached. In those cases where it is found impossible to drive the needle through the outer wall of the process on account of its density or thickness, the hand or engine drill should be employed and the conical needle used to infiltrate the cancellous tissue. The shape of the needle causes it to bind in the puncture made by the drill, preventing leakage of the anesthetic and insuring its infiltration. Before using the drill the gum should always be anesthetized in the usual way.

The ordinary hypodermic needle should never be used where the process has been penetrated with the drill, as the long steel point is

liable to be broken off within the body of the alveolar process and is then very difficult to remove.

To avoid unnecessary laceration of the gum and periosteum when drilling through the outer plate of bone, the drill should be lubricated with vaseline and pressed through the gum to the bone before rotating the hand drill or starting the engine.

If the gum is loose and soft and liable to wind upon the shank of the drill it is well to make a short incision in it with a small bistoury through which the drill is to be inserted. Several factors govern the selection of the point where the needle is to be inserted or the drill employed.

Anesthesia for Incisors and Bicuspids.

In anesthetizing the incisor and bicuspid teeth the needle should be inserted in the gingival papilla and directed at an obtuse angle with the long axis of the tooth in such a manner as to reach the interdental septum at a point sufficiently far from its apex as to avoid the danger of breaking off this delicate point of bone and to insure reaching the cancellous portion of the septum between the roots of the teeth.

Molars.

In operating upon the upper molars the needle should be directed upward and backward so as to penetrate the septum and reach the cancellous tissue between the mesio-buccal and palatal roots of the teeth. For the lower molars the needle should be directed downward and inward, reaching the cancellous tissue of the interdental septum as deeply as possible between the teeth.

In no case should the needle ever enter the peridental membrane or be inserted underneath the free margin of the gum. In cases where the roots of the teeth are nearly parallel and close together, only a very thin interdental septum containing but little cancellous tissue will be found, and the puncture should be made in an adjoining interdental space, or the outer plate of bone should be perforated with the drill near the apex of the tooth to be anesthetized and the conical needle used to complete the process.

Bearing in mind the fact that the buccal plate of bone covering the roots of the lower molar teeth is frequently difficult to penetrate with the needle, and that the roots of these teeth may have a decidedly distal inclination, it is often necessary to use the drill in operating in this region, the puncture being made deeply and distally to the long axes of these teeth.

In operating upon or extracting the lower third molars an injection in the retromolar triangle is sometimes necessary, the bone here, as a

rule, being easy to penetrate by tapping the needle into it. In children and young people and in those cases where the gums are thick and dense and easily blanched by the first two or three drops of anesthetic injected, the process may almost always be punctured by the tapping method, but in those cases where the gums are thin and loose, sliding easily over the process, and the position of the roots is indicated by ridges of bone overlying them, the outer plate of the process is frequently hard and brittle and the cancellous tissue is best reached by the use of the drill. The upper cuspid teeth having long and deeply imbedded roots are often best anesthetized by drilling through the process distally to the apices of their roots.

One injection usually anesthetizes two or more teeth, and advantage should be taken of this fact and the puncture made accordingly, if more than one tooth is to be operated upon at a sitting.

Conductive and mucous anesthesia may be employed in conjunction with the intra-osseous method; there is a wide field of usefulness for all of them, but for immediate results, intra-osseous anesthesia being instantaneous in its action, for comfort in operating and for avoiding the discomfort of the patient to as great an extent as possible, the intra-osseous method possesses many features which make it preferable to all the others for the painless preparation of cavities, the removal of pulps, the amputation of the roots of teeth, the removal of cysts, and such other surgical procedures as come within the province of the average practioner of operative dentistry.

Non-Cohesive Gold Filling.

By F. W. Bliss, D.D.S., Santa Cruz, Cal.

From the time when the holding of an exposition to celebrate the completion of the Panama Canal, first had its inception in the minds of a group of San Francisco's foremost men, up to the present day, the members of our profession in California, have been looking forward to this International Dental Congress. We have wished to meet and exchange ideas with our professional brothers of other States and of other countries. We feel that having with us, as our guests, such distinguished members of the profession cannot fail to mark an era in dentistry in the State of California. I therefore, appreciate the great honor conferred upon me by our Chairman of the Section of Operative Dentistry, in inviting me to appear before this Congress with a paper on Non-Cohesive Gold Fillings.

I am glad that he has asked me to write upon this subject, for as an older member of the profession I have, in my thirty years' practice, demonstrated to my entire satisfaction the superior adaptability of non-cohesive gold in many cases.

I had the good fortune to have as my preceptor, before entering college, Dr. O. Willson, then President of the Illinois State Dental Association. He was a superior operator in ths use of non-cohesive foil. In a letter of recent date received from him, relative to the early history of non-cohesive foil; he says: "I believe all gold fillings were of non-cohesive foil previous to 1850, and to this day venerate its merits as compared with cohesive gold." In support of this he says that in 1852 he had two front teeth filled with non-cohesive foil which have remained intact up to two years ago, a period of sixty-two years. Following up the history of non-cohesive foil to a later date he says, "I also saw work done in 1870, by Dr. Allport of Chicago with non-cohesive foil; most superb work, with a speed I have never seen excelled."

I have observed that among the young members of our profession, there are many who are watching for everything that is new, who exploit all the new discoveries, thinking that materials and methods, as

well as men, which have the stamp of age upon them, should be Oslerized.

There is no greater advocate of progress in our profession than myself. I realize that the graduates of to-day have a great advantage over the graduates of thirty years ago; yet I agree with a writer in the *Dental Review,* when he says, "An operator should be sure of his ground before he abandons a thing that in his hands has proven good. Try out all the new things, but do not burn the bridges behind you."

Advantage of Non-Cohesive Gold.

It is not my purpose to-day to deliver a technical treatise on non-cohesive gold, but to revive faith and interest in what is regarded by many as antiquated and almost obsolete. For it has been said that the world needs not so much to be informed as to be reminded.

It is of great importance that a man in our profession should be able to diagnose a case correctly; by this I mean one who should have a practical working knowledge of, and experience with all the tried and proven materials and methods, both old and new, used in his profession, and at the same time should possess that instinct, which is almost inspiration, enabling him to select promptly and with assurance, the materials for a given case which will promise the best success. During my practice it has been my well formulated and definite aim to make such an operation as will most surely serve the best interest of my patient, and I have studied carefully the action of different fillings under different conditions. Hence I feel many here present will bear me out in the statement that non-cohesive gold is preëminently adapted to the filling of cavities located on the occlusal surface and also cervical cavities extending under the gum margin.

I use non-cohesive gold on the wedge principle with the use of cylinders of various density and length, varying according to depth of the cavity, placing the cylinder upon end reaching from the bottom of the cavity, and extending well over the surface, placing the loosely rolled cylinders around the margin, side by side forcing them by pressure into the minute irregularities of the cavity margin, and finishing up the center of the cavity with denser cylinders and lastly using a cohesive gold cylinder rolled tightly between the fingers, which will make a firm and binding wedge that may be easily pushed in the last remaining space reaching from the top to the bottom of the cavity, making use of the interlocking principle, which secures the non-cohesive gold in the cavity. It is the perfect adaptation to the cavity margins that makes non-cohesive gold so enduring that it will last nearly ninety-nine years.

Durability.

In my experience, non-cohesive gold when used in carefully selected cavities has no superior in durability and for the preservation of teeth. I have

already cited the remarkable case of Dr. O. Willson. I cannot forebear to refer to a case from my own experience. More than twenty-five years ago I put in a non-cohesive gold filling for Dr. L. A. Teague, a well-known member of our profession, in a clinic before the California State Dental Association, and in a letter recently received from him he says the filling is still giving good service.

Another remarkable case of the durability of a filling of non-cohesive gold, was given me by our Chairman on operative dentistry, Dr. John S. Marshall. In 1870, when practicing in the East he had filled a number of occlusal cavities in bicuspids and molars, and last year, while visiting in Syracuse, N. Y., found to his surprise that three fillings were still doing good service, a period of forty-five years. Dr. Marshall also told me that he had seen fillings made by Dr. Amos Wescott and Dr. Dwinelle of New York City, that had been in use for over fifty years; a fine record.

Filling teeth with non-cohesive gold should certainly have its place with every dentist, for it will make his burden lighter and he will be able to perform a better and quicker service, and earn the lasting approbation of his patient by making fillings that have a durability unequalled by any other method or material.

Saving of Time.

Before our world was run on Twentieth Century Limited time; before the use of steam or electricity or telephone or automobile or flying machines: before the fever and rush in the life of our business man was like the fever and rush of Wall Street stock exchange in a financial panic, back in the Seventeenth Century, a great poet said, "Time wasted is existence; used is life." So if by the use of this material and method we can save for our patient and ourselves even a few valuable moments, have we not earned his gratitude?

Advantages.

The rapidity with which non-cohesive gold may be placed in a cavity is one of the great advantages in its use, a great saving of time which is mutually appreciated by both patient and operator. I have frequently put in medium sized fillings in from seven to twelve minutes, which if I were to use cohesive gold, would take from twenty-five to thirty minutes. I am not an advocate of the use of non-cohesive gold to the exclusion of other methods. I use it when and where in my judgment I may accomplish a better service by its use. Thermal shock is found to be far less in teeth filled with non-cohesive gold than any other form. Not being welded into a solid mass, the filling remains in separate pieces, of which it is composed, and thereby lessens the conducting quality of the gold, making it far more comfortable for sensitive teeth; for this reason a filling of non-

cohesive gold may be placed much nearer the pulp without causing any inconvenience by thermal changes.

With the foregoing illustration citing the remarkable durability of non-cohesive gold fillings and taking into consideration the rapidity with which a non-cohesive gold filling may be placed, is it not a surprise that such a valuable asset as the non-cohesive method of gold filling should be so neglected and consequently so little understood? I wished to find out if possible why this condition prevails, so I wrote to several colleges of dentistry throughout the United States to find out to what extent the non-cohesive method of gold filling was being taught. In a letter recently received from the Dean of a prominent dental college he made the following statement: "The use of non-cohesive gold has almost gone out of practice, and is almost a lost art. It is a great loss to dentistry for much can be said to its advantage." After investigations made along this line, I feel that the words of this Dean express the attitude of many of our dental colleges of the highest standing, on the subject of non-cohesive gold. Though the subject appears in their curricula, and the theory is taught after the G. V. Black system, yet in so far as its use in the clinics is concerned, very little attention is paid to it, and from the testimony of recent graduates practically no work is required of the students. This I think, explains the condition of affairs relative to the use of non-cohesive gold. But I feel that a brighter day is dawning for this much neglected method. One who stands high in our profession, who has his finger on the pulse of the future is granted this vision:

"I know that non-cohesive gold has a place in dentistry that no other form of gold can fill, and I venture to say that in the next twenty years the pendulum will swing back again to non-cohesive gold foil, for all cavities having four walls; and even to-day many of our best gold operators Drs. Black, Wedelstedt and others are using non-cohesive foil at the cervical margins of their approximal fillings, when a few years ago had one adopted such a method he would have been laughed out of court."

Recessional Lines of the Horns of the Pulp in Relation to Operative Dentistry.

By H. G. Chappel, D.D.S., Oakland, Calif.

This paper is written because of a desire to call your attention to certain peculiarities of structure of the human teeth that seems to have been largely overlooked by the majority of dentists, a familiarity with which I believe, will enable the dentist to operate more intelligently.

With the dentist as with the surgeon, manual dexterity is an absolute necessity, but both surgeon and dentist need something more than skillful fingers if they would give their patients the highest class of service. They should thoroughly know the tissues upon which they are working, both microscopically and macroscopically, in health and in disease.

The late Dr. G. V. Black, in his work on *Operative Dentistry,* has called attention to the recessional lines of the horns of the pulp and their relation to operative procedures. Dr. E. K. Wedelstaedt has also called attention to them in his Black Club lectures, but beyond these two gentlemen, the subject seems to have been ignored by dental writers. It appears to me that a knowledge of the position and peculiarities of these recessional lines should be a part of the instruction of every dental student in order that he may later on operate more intelligently upon the teeth of his patients.

I shall discuss only the upper and lower molars, for they are the teeth which are most likely to give us trouble, and if their internal anatomy is understood, the peculiarities of the other teeth are readily grasped.

I judge that every person here is sufficiently familiar with dental embryology to know that when the indipping epithelium that is to form the enamel organ has progressed to a certain point, it is met by an upward growth of connective tissue in the form of a papilla which pushes as a finger, into the epithelial cells until it forms a cap or thimble-like covering over the end of it.

The thimble-like covering becomes the enamel organ, while the

cells nearest to the papilla become differentiated into ameloblasts, and the secretion of lime salts and deposition of enamel begins. On the other hand certain cells of the dental papilla become differentiated into odontoblasts and these arrange themselves over the tip of the papilla and begin the secretion and deposition of dentin.

While the enamel organ disappears after the crown of the tooth has been completed, the dentin-forming organ, or dental pulp, continues to live and functionate all through life, unless its death is caused by disease, traumatism, or its surgical removal.

After the tooth (both crown and root) is fully formed, the deposition of dentin progresses very slowly, unless accelerated by some irritating cause, when the process will proceed more rapidly. This deposition of dentin must, of course, result in a gradual recession of the pulp from its former position, as also an attenuation of the body of the pulp.

That portion in the extreme crest of the pulp is the one which interests us most, as it is the part extending into the crown of the tooth, and is thus most likely to be interfered with in the preparation of cavities for the insertion of filling materials. It is also the part most likely to be exposed by the ravages of caries. The points of the pulp, just under the main cusps of the teeth, are the longest and are called the horns of the pulp.

Position of Horns of Pulp at Eruption.

When a tooth is first erupted the pulp is quite large and the horns of the pulp extend, in nearly all cases, to the dento-enamel junction or very close to it. Ten years later the pulp is notably smaller in size and the dentin correspondingly thicker. Generally the horns of the pulp recede in about the same ratio as the coronal portion of the pulp. This process of gradual recession of the pulp and deposition of dentin in its place, goes on very slowly all through life, until in old age—we sometimes find the pulp cavity entirely obliterated, although this is not always the case.

I said a moment ago that the horns of the pulp *generally* recede in like ratio with the coronal portion, but there are exceptions to this rule. Sometimes the horns of the pulp do not recede, but persist as a slender filament of tissue almost to the dento-enamel junction and this holds good, well into middle life or even beyond. At other times the horns may recede, but do not deposit dentin in the place from which they have receded. Injudicious excavating of the tooth structure, in this locality, will expose a small opening that connects with the pulp but it contains no pulp tissue.

Results of Normal Recession of Pulp.

When the recession takes place in a normal manner, dentin is deposited in the space occupied by the horn just as it is by other portions of the pulp, except that the dentin does not seem to be of quite the same consistency or quality as that which composes the bulk of the tooth. In some teeth it seems to be of greater density than the other dentin, much like secondary dentin, while in other teeth it seems to contain more organic material as shown by the manner in which it is affected by stains, which is somewhat similar to the manner in which stains affect newly deposited dentin, although not so dense a stain is deposited.

In either case, these regions of the recessional lines appear to be more sensitive than other parts of the dentin, and if cut through while excavating, they are very likely to cause trouble for the patient by making the tooth peculiarly susceptible to thermal changes and often setting up a condition of hyperæmia in the pulp which may finally result in the death of that organ. Therefore, whenever possible these regions should be avoided while removing carious dentin.

Position of Pulp in Upper Molars.

In the upper molar the pulp has three principal horns; one each for the mesio-buccal, disto-buccal and mesio-lingual cusps. The disto-lingual cusp if of medium or large size may also have a horn, but it is generally of small size, or it may be entirely absent. Again, where an upper second or third molar is compressed mesio-distally, we may find but two horns to the pulp, one placed buccally, the other, on the lingual side of the tooth. In this case the horns are generally of about equal length.

Of the three main horns, the mesio-buccal horn is almost invariably the longest, the disto-buccal horn next in length and the mesio-lingual horn the shortest. This rule will hold good in the majority of cases, but there are exceptions. In a few cases I have found the mesio-lingual horn the longest.

The horns of the pulp are placed a little nearer the center of the tooth than the crests of the three main cusps, while the mesio-lingual horn is generally a little to the distal of the crest of its cusp, unless the disto-lingual cusp is large, indicating a fourth horn, in which case it will be found to bear the same relation to its cusp as that held by the other horns. They incline centrally as their base or connection with the main body of the pulp is approached; consequently in young persons we are likely to find them more nearly under the cusp than they are in later life, for the reason that they are longer. If you will imagine these three horns

as forming a truncated cone, the base of which is formed by the tips of the horns, the truncated portion being where the horns are joined to the main body of the pulp, you will readily grasp why you are likely to find the tips of the horns more nearly under the cusps in the young than you will in later life when recession has taken place.

In operating on the upper molars we should take advantage of a knowledge of the position and relative length of these horns. For instance, if a cavity involves the mesial and occlusal surfaces of the tooth, we should bear in mind the position of the mesio-buccal horn and remember that it is quite sure to be the longest one. After establishing our cavity outline in such a position as to insure comparative immunity, we may cut a little more freely towards the lingual portion of the tooth, especially in the step portion of the cavity, as we are less likely to involve the horn of the pulp in that direction than toward the mesio-buccal angle.

As the force of the lower jaw is exerted in an upward and forward direction, it is necessary that operations on the mesial occlusal surfaces of the molars be more securely anchored than those involving the distal occlusal portion of the tooth. It seems as though nature had anticipated this for she has placed the mesio-lingual horn just a little to the distal of the crest of the cusp, thus giving us the opportunity to make the step portion of the cavity slightly wider, giving greater strength to the operation without endangering the pulp.

Where the tooth has the disto-lingual cusp well developed, thus indicating a fourth horn of the pulp, the mesio-lingual horn will be found a little nearer the mesial surface, but even under such circumstances the width between the mesio-buccal and mesio-lingual horn is considerably greater than that between the disto-buccal and disto-lingual horns.

In a cavity involving the distal occlusal surface of an upper molar, the step portion should be cut narrower than in one on the mesial occlusal surface, because it is not necessary to obtain so strong an anchorage as on the mesial-occlusal surface and also, because the horn from the mesio-lingual cusp, or disto-lingual cusp if present, is a little closer and consequently more likely to be involved.

When operating on a cavity on the occlusal surface of an upper molar, the caries will sometimes penetrate quite deeply into the center of the tooth. When the caries has been removed, it is not wise to cut down the surrounding tissue to a level with the deepest portion of the cavity in order to obtain a flat seat for the metal. By so doing an operator often runs great risks of cutting through the recessional lines even if the horns of the pulp are not involved. In such a case, it is better to fill

the deep portion of the cavity with cement, thus bringing it up out of the danger region, and then square the cavity and level the seat. If in any way it can be accomplished, the filling material should rest on dentin and not on cement alone.

If it be necessary to devitalize the pulp in an upper molar and you wish to expose the pulp, remember that the mesio-buccal horn is the longest, and, other things being equal, it is the one that you can reach most quickly, thus saving time and annoyance.

Position of Pulps in Lower Molars.

The lower molars have four horns and apparently no difference is made whether the tooth has four or five cusps. When a tooth has five cusps, the distal cusp, or what some writers call the disto-buccal cusp, is the one not having a prolongation of the pulp passing into it.

Of the four horns, the two mesial horns are longer than those under the distal cusps; the mesio-lingual horn is the longest one in the tooth, the mesio-buccal being the next in length. The disto-buccal and disto-lingual horns are about the same length as each other, but both are shorter than the mesial horns.

Like the horns of the pulp in the upper molars they are placed just centrally to the cusps from which they take their names and approach the center line slightly as they near the body of the pulp.

Here again nature seems to have favored us, for as the stress on our operations is greater on those which are placed in the distal occlusal surface of the lower teeth, this is the position where the horns of the pulp are naturally shorter and we can consequently secure broader and stronger anchorage without running the risk of involving the recessional lines of the horns of the pulp.

When operating on the mesial surface of the lower molars, great care must be taken, because the horns of the pulp are often very long in this particular part of the tooth. If for any special reason, very strong anchorage is necessary in this region, it is better to cut the step portion a little deeper than to attempt to make it broad. Remember always, that the younger the patient, the greater is the danger of involving either the horns of the pulp or at least the recessional lines when excavating.

We have all had patients, who after we had made an operation for them, would return complaining that the tooth was extremely sensitive to thermal changes. We were positive that we had not caused an exposure of the pulp, but it is almost always a sign that we have cut across the recessional lines of the horns of the pulp. This should be

avoided if possible, as it is very likely to cause the patient and ourselves considerable trouble.

Fortunately for us the horns of the pulp, as also the main body of the organ, gradually recedes as the years go by, and we are in less danger of cutting into the horns. In most cases, as age advances, the extreme sensitiveness of the recessional lines also seems to decrease, but there are enough cases where they still retain so much sensation that we should always be on the lookout for them. We can never cut into a vital tooth with impunity, for there are no external signs that will tell us positively what has occurred in its interior. We know that slow progressive caries, abrasion and erosion tend to stimulate the pulp to action in depositing dentin, and we naturally expect to find recession of the pulp in these cases, but it is not always so, for now and then we will find a case where even in middle life the horn of the pulp still persists to an extreme extent in spite of the stimulating agencies mentioned.

In abrasion of the bicuspids and molars we note that the dentin begins to cup out first where the cusp was originally; therefore, it is not wise to wait until the abrasion has become extensive, because this may involve a horn of the pulp that for some reason, unknown to us, has not receded as we would expect. An operation on the tooth and insertion of a metallic filling is indicated very soon after the dentin begins to hollow out from abrasion.

In the examination of Indian skulls, I have seen quite a number of teeth where a horn of the pulp has been exposed from abrasion resulting in the death of the pulp and the development of an alveolar abscess.

The insertion of oxyphosphate of zinc cement in cavities seems to act as a stimulant in causing recession of the pulp and it can sometimes be used to advantage for that purpose.

Long pointed cusps generally indicate long horns to the pulp and vice versa, but this is not an infallible guide.

I have endeavored to obtain a series of teeth starting at six years of age and every ten years after, in order to show changes that take place in the form and size of the pulp chamber but have found it impossible to do so. I should advise each of you whenever you secure a molar, where caries has not made much of an inroad, to use your jewelers hand saw and separate the crown from the roots at the cemento-enamel junction and study the pulp chamber and its prolongations. Do this, not once, but many times and your acquaintance with these pulpal horns will enable you to operate with increasing intelligence.

In closing this short essay, allow me to leave this thought with you. Until the men who are in the practice of dentistry realize the importance and value of having a comprehensive knowledge of the anatomy

and histology of the human teeth we may expect a continuance of the present existing conditions. Many troubles, which could be avoided, come from men being unfamiliar with the tissues upon which they are operating.

Let me ask you, is such a condition indicative of that comprehension and knowledge which should be in the possession of every high-class professional man? If not, why does it exist?

Let us not be content until we know thoroughly the tissues which we are called upon to treat.

A Method of Extracting Deep-Lying Roots and Teeth.

By Dr. Th. Weber, Helsingfors, Finland.

The extraction of deep-lying roots has often been discussed in our professional journals. In most cases, it has been a matter of resecting the alveolar wall; in some exceptional cases, the method of boring out the root, has been applied. At one of the meetings of the Finnish Dentists' Society, Mr. Hahl demonstrated an instrument constructed by Adolf Witzel, which is sure to have done good service in many cases. As, however, in these different methods, and especially when using the resection-forceps, a more or less grievous damaging of the gum and, in particular, of the jaw-bone, cannot be avoided, one does not readily adopt such an operative procedure. Moreover, during pregnancy and in hæmophilia, they are contraindicated.

Thus, the method of resection is, in certain cases, but not in all cases, an appropriate one.

Author's First Use of His Method.

At the beginning of 1904, a lady was under my treatment, who suffered from a severe toothache, caused by a deep-lying root. Her husband, a physician, wished the root in question to be extracted, but the patient being in the third month of pregnancy, and having, besides, gone through a miscarriage a little more than a year before, I did not like to attempt a severe operation. I then hit upon the idea of extracting the root by means of a continual pull with an India-rubber ring. I overcapped the neighboring teeth with vulcanite and fixed in this prosthesis a gold wire, which lay across the root in question, the wire being supported by the point of the lateral incisor and the morsal surface of the first bicuspid. Thus, the last-named wire formed a bridge across the space between the lateral and the first bicuspid. Of a narrow strip of gold I made a sort of brace, in form rather like a pair of sugar-tongs, and having tied to it an India-rubber ring, I pressed the brace with its ring into the root canal, where it stuck without being cemented. The India-rubber ring, I now tied to the gold wire lying across the root. The India-rubber ring now exerted on the root, a constant traction down-

wards, and in ten days the root was so loose that I was able to extract it without the least difficulty (Fig. 1).

Encouraged by this successful result, I have applied this method on several different occasions. In cases when the root is so hollow that no hold for the above-named brace in the root can be obtained, a little hole is bored in the thin wall of the root and the India-rubber ring is fastened by means of a ligature on the edge of the root (see model No. 2, Fig. 2).

Fig. 1. Fig. 2

A case, also under my treatment, may be of interest:

A lady, 45 years old, had a prosthesis of seven artificial teeth, which for several years had done good service. This row of teeth gradually becoming uncomfortable—it had begun tipping—the patient sought help from her dentist, who now found out that a retarded cuspid tooth was on the point of breaking through, in consequence of which the gum was raised and this was the cause of the plate feeling uncomfortable. Her dentist then determined to extract the tooth, but the crown of the tooth being only half-out of the jaw, it therefore offered no hold for the forceps, especially as the crown of the tooth was conic; so the extraction, from the above-named reason, failed, of course.

The patient renewed her visit on the following day and was told that the tooth could not be extracted at that time. However, after the

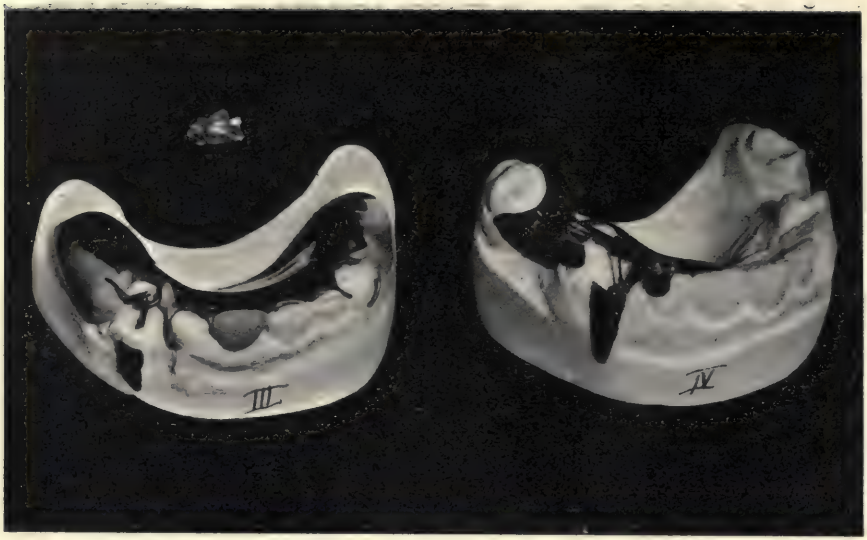


Fig. 3. Fig. 4.

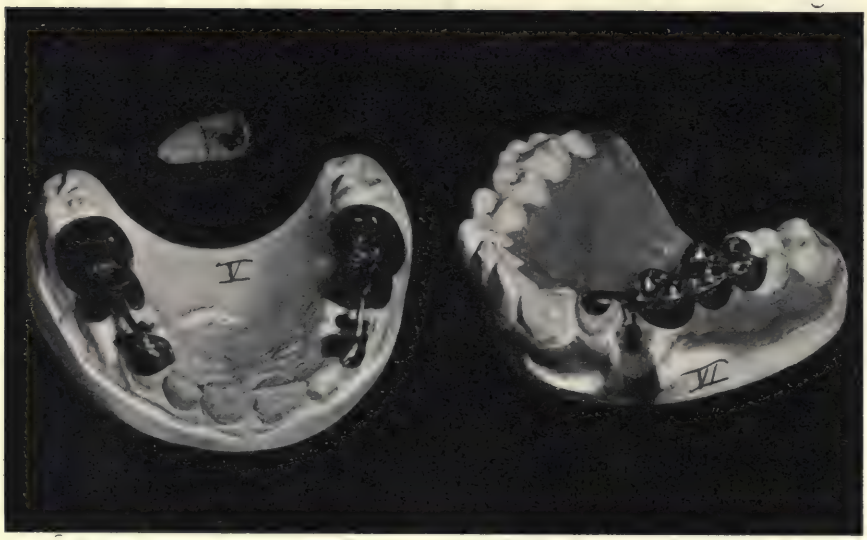


Fig. 5. Fig. 6.

failing trials of extraction, the patient had toothache and came to me for help. After a careful examination I found an extraction with forceps absolutely impossible. I then determined to bore a little hole in the crown of the tooth. I cemented a little metal wire, with a little loop in

it, into the hole and made a vulcanite plate, furnished with gold wire, which served as a hold for the India-rubber ring. The unfavorable position of the tooth—the root was, near the point, somewhat bent—and particularly some slight exostosis, rendered my work unusually difficult. Almost a whole month was required to extract the tooth, so as to get the crown outside the jawbone. The tooth now being very much loosened, I determined to extract it, which was accomplished without

Fig. 7.

difficulties. The model No. 7 (Fig. 7), to which the tooth is added, will also show its position in the jawbone. The other illustrations show variations in the method to suit circumstances.

Case Reported by Dr. Bjalmar.

Mrs. N. N. had last November the +5 root drawn. Some ten years ago I extracted a tooth for her and although I did not use any adrenalin solution at the time, she had a severe after-bleeding which it was difficult for me to stop with the aid of the surgeon then assisting me. She told me she had since that time had some roots extracted and each time a severe hemorrhage had set in later.

As there was now reason to fear a similar after-bleeding, I resolved to use Dr. Weber's method of extraction. I consequently applied a celluloid cap, to the outer edge of which a metal hook had been attached close to the +2, +3 and +6. Having cemented a small metal hook to

the +5 root I used a very fine India-rubber ring in order to extract the root. I wanted to remove the same as slowly as possible so as to allow the sides of the extraction wound to granulate while the root was coming out of the alveolus. After a few days I had succeeded in removing the root without the patient (who was surely hemophile) having had any after-bleeding. This case shows how severe dangers often occurring in

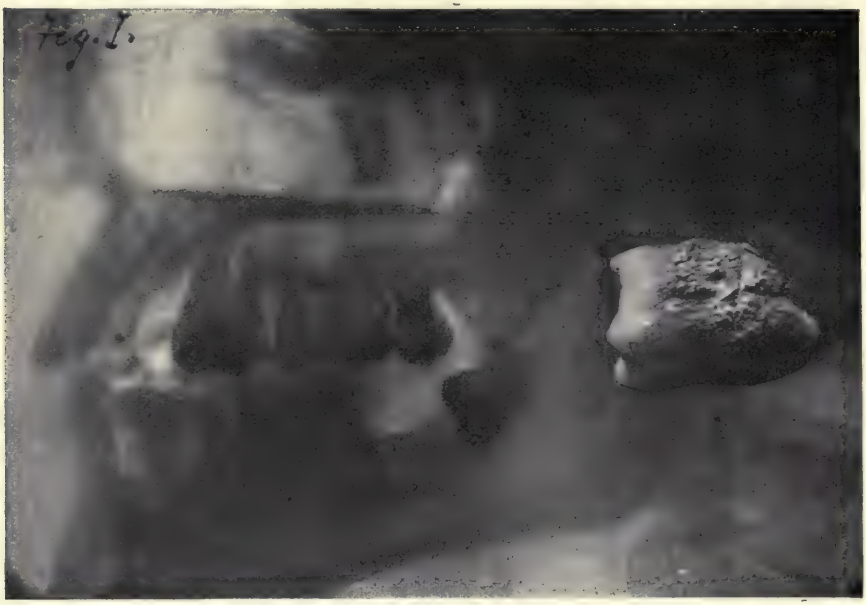


Fig. 8. Fig. 9.

extractions may be avoided by using the method of extraction presented by Dr. Weber and it is a proof of the great practical importance of this method.

Case Treated by Prof. Carl Christensen, Copenhagen, Denmark.

The patient, Mr. B., purveyor to the King, 46 years old, called on me in the autumn of 1908 and asked me to ascertain whether some violent pains, which he periodically felt in the left side of the jaw might be due to the existence of a wisdom tooth.

By means of a Röntgen examination it became evident that the supposed tooth which was not yet visible in the mouth, lay rather deep in the jaw with its root in a somewhat recumbent position in the ramus. The removal of this tooth in an ordinary manner was therefore con-

sidered to invite great difficulties, the more so as the nature of the whole region, the swollen soft parts and a powerful masseter put obstacles in the way of the application of instruments.

In consideration of the danger which there was, according to experience, in connection with the luxation of dislocated teeth in this region I suggested to the patient the use of the elastic traction, *ad modum* Weber and performed the operation with the patient's consent in the following manner:

By making an incision in the gum and subsequent tamponades so much room was obtained in the course of two days as to enable the boring of a hole about 2 millimeters deep in the visible part of the masticating surface which had a vertical position. A hook with cement was applied to the tooth and to this hook an India-rubber (Faber No. 3) was made fast and stretched on to a loop which was attached to a palatal plate that was placed upon the teeth of the upper jaw so as to allow the bite to rise sufficiently in order to make room for the expected extraction of the tooth in such manner that all the upper teeth gave the necessary support to the traction.

In the course of seven days the effect of the traction was that about the uppermost fourth part of the masticating surface of the tooth became visible. On examination it was ascertained that the tooth had become loose to such an extent as to make it comparatively easy to remove the same by means of a dental forceps.

The tooth having been extracted showed a peculiar brush-like thickening of the peridontium on the lower root surface—in the direction of the traction.

Without more complications the wound was healed in a short time.

(1) See Fig. 8, which shows the position of the tooth on the day when the extraction took place.

(2) See Fig. 9, photograph of the tooth extracted (magnified).

Operative Procedures in Relation to Dental Caries and Diseases of the Investing Tissues.

By Arthur D. Black, A.M., M.D., D.D.S., Chicago.

A review of the literature of the procedures in operative dentistry for the past sixty odd years reveals a peculiar lack of relationship between the pathology of dental caries and the diseases of the investing tissues of the teeth and the means employed in treatment. The lack of consideration for the investing tissues, because of failure of appreciation of their functions when in good health, and insufficient knowledge of the pathological changes when diseased, is one of the striking characteristics of dental practice.

It is not the intention of the author that this paper shall review in detail the progress which has been made in co-ordinating pathology and treatment, but attention will be called to certain things which have been more or less epoch-making in our advancement.

Previous to 1890 little mention of the pathology of caries will be found in the literature of operative dentistry. The principal thought in the minds of most dentists previous to that time seems to have been to cut a cavity of such form that a "plug" might be placed securely. Even Dr. Miller, to whom all honor is due for the discovery of the micro-organisms which cause caries, had practically nothing to say of the pathology in relation to operative treatment. This was probably due to the fact that for a number of years he and others of our best men thought to treat caries by destroying or inhibiting the growth of the organisms, just as Koch expected to cure tuberculosis by destroying the tubercle bacilli. These studies apparently led Miller away for the time at least, from the more careful study of other details in the pathological process which later formed the basis of proper operative treatment.

Filing Between Teeth.

Among the few early efforts at treatment of dental caries, that of Robt. Arthur, in filing away the proximal surfaces of the teeth to treat or prevent proximal decays, should be mentioned. Here was a plan—an effort to treat the disease—based upon the observation that

proximal decays generally occur a little to the gingival of the contact point. It was reasoned that if the enamel of that portion of the teeth were cut away, such decays would be prevented, and the view was correct. But it did not require many years to learn that the destruction of the interproximal soft tissue was much more serious than the proximal decays, because this treatment permitted the impaction of food between the teeth so filed, and this resulted, not only in new decays in the region of the gingival line, which were much more difficult to treat than the ordinary proximal decays, but also in serious disease of the peridental membrane.

The practice of extracting four bicuspids to give the teeth room to separate a little, was another similar effort.

Closely akin to the above was the plan of using "separating" files to cut away portions of proximal surfaces as a part of their preparation to receive fillings. Before the use of cohesive gold became general, this was necessary for both access and retention, and as the contour could not be restored with non-cohesive gold, the spaces were necessarily left wide open, resulting in the mutilation and eventual destruction of the septal tissues.

It seems to require disaster and calamity to make us see things which we should have seen before. It required an Iroquois Theatre fire to make our theatres all over the country reasonably safe; the disaster of the *Titanic* was necessary to secure ample facilities in the matter of life-boats, etc.; the more recent *Eastland* horror in Chicago will doubtless bring about more careful inspection and better construction of our lake and other pleasure boats. In the same way, many of the dental procedures of the early days, which resulted in such dreadful destruction of the investing tissues and the eventual loss of many teeth, with no one knows how great a toll of life from more serious conditions resulting secondarily, have opened our eyes to better methods of operating.

It was the combination of the discovery of the cohesive property of gold foil—also by Dr. Arthur—and of the rubber dam by Dr. Barnum, together with the recognition by a few of the damage resulting from the open contact, which lead to the effort to restore contacts by filling operations. Here was the beginning treatment by operative procedure for the prevention of disease of the investing tissues.

Extension for Prevention.

Then came the proposition of "extension for prevention" as applied to cavity preparation in the treatment of dental caries. While this subject has been discussed as much as any in our literature during the past twenty years, and therefore needs little mention here, I would like to impress the fact that it was based on a very careful study of the pathology of caries, and I believe it will go down in history as the first

serious scientific effort to place the treatment of dental caries in proper relationship to the disease. This study included nothing of theory; only facts which have become quite clear to those who have been sufficiently interested to observe them. These studies dealt entirely with surface involvement of the enamel and consisted of: 1. A tabulation of many thousand small (beginning) decays, which established the fact that practically all decays begin in certain positions which naturally group themselves into pit and fissure, proximal and gingival third decays. 2. The observation of the extent to which these decays might eventually spread on the surface of the enamel, which made it possible to establish reasonably definite lines of immunity. These have since been our guide in the preparation of outline forms of cavities.

Restoration of Contact to Protect Gingivæ.

These studies of the progress of caries brought out prominently the importance of the healthy gingivæ as a factor in limiting surface extensions, and the necessity of so executing the filling operations that the best health of the gingivæ would be conserved. This involved the study of normal contours and contacts in relation to diseases of both the hard and the soft tissues, and served to establish the fact that with every operation involving a proximal surface or a gingival third position, the future health of both the hard and soft tissues must be given due consideration. It seems that the profession does not yet sufficiently appreciate the relationship of the filling operation to the future health of the soft tissues.

Relation of Teeth to the Healthy Mouth.

The most conservative treatment should be based on the fullest possible knowledge of the histological structure and physical functions of the tissues with which we are dealing; also of the pathological processes to which they are subject. Just as it is necessary to know the minute structure of the tooth in order to understand the beginnings and progress of caries, so is it essential that the structure, including particularly that of the specialized elements, of the gingivæ and peridental membrane be well known. We must also come to recognize more clearly than we have heretofore the picture of the healthy mouth, in order that we may be better able to detect the slight deviations from normal which will enable us to apply treatment for the protection and conservation of these tissues earlier than has been commonly done.

The problem of dentistry to-day is that of the clean mouth. The clean mouth is the healthy mouth. Natural forces are of much greater importance in maintaining mouth cleanliness than artificial cleaning. The mouth which will require the least of artifical cleaning, by either dentist or patient, is the one in which all of the teeth are present in normal oc-

clusion, with the investing tissues everywhere entwined about the teeth, with gingivæ thinning away to almost knife edge crests on all buccal labial and lingual surfaces of the teeth—conditions which promote natural cleanliness by facilitating movements of foods over tooth surfaces and gingival margins to positions where they are controlled by the various muscular tissues until finally ready to be swallowed, leaving the least possible residue in the mouth.

We should recognize the conditions necessary and the forces which operate to maintain the healthy mouth, also the injuries which result from any interference or interruption of these. Many have doubtless seen skulls of squirrels and other rodents which had suffered a fracture of a lower incisor tooth, with the result that the corresponding upper tooth was not kept of normal length by wear, and by its continued growth caused the death of the animal from starvation. In such cases the balance of action between forces, which normally operate to maintain health, is lost with disasterous results. So in the human mouth we often see injury and disease as a result of the lack of balance between normally opposed forces, as in the movements of teeth after the extraction of one or more. Practically every such occurrence diminishes the natural cleaning by vigorous mastication, and thus contributes toward disease. If the peridental membrane is seriously injured along one side of the root of a tooth, the balance of pull of the various fibres of the peridental membrane is lost and the tooth is moved out of position—away from the injured side. If the original injury is to the interproximal tissue, due to lack of contact of the teeth, or to an abnormal contact, the inflammation will usually result in the movement of adjacent teeth and the gradual involvement and destruction of their investing tissues as well.

Gingivitis Due to Faulty Dental Operations.

Carefully compiled statistics show that in the mouths of young adults—between the ages of twenty and thirty-five—there are, on the average, about eight areas of gingivitis per mouth, and that more than half of all such inflammations are due to dental operations, in the performance of which the dentist has failed to restore proper contours or contacts. These inflammations are the beginnings of disease involving the peridental membrane, and a full understanding of the pathology of both will result in greater care in each operation performed.

We must presume that dentists have generally failed to recognize or appreciate the connection between the imperfect operation and the pathological condition which has resulted, because if the relationship were appreciated, we can hardly believe that so large a number of cases would continue to present in which the imperfect dental operation is the direct cause of the disease of the peridental membrane.

Natural Cleansing Better than Artificial Cleansing.

Many members of the profession seem to be over zealous in their efforts at artificial cleanliness without exhibiting in their operative procedures sufficient appreciation of the highest efficiency of natural cleanliness by the maintenance of the best possible contours and contacts. It is far better to so perform our operations that there will be the most effective natural cleaning by mastication, requiring so little of artificial cleaning that this may be done for the most part by the patient, than to establish as a result of inperfect operations conditions which make natural cleaning impossible and much artificial cleaning imperative.

The principal thought in the preparation of this paper has been to emphasize once again the fact that not only recurrences of decay, but also a very large percentage of cases of disease of the peridental membrane are preventable by the institution of more careful technic in operative procedures; that our treatment of the mouth, by filling operations and otherwise, should be undertaken and carried out quite as much on the basis of the condition of the soft tissues as of the hard. To do this as a regular routine procedure, we should make a definite record of each area of inflammation of the investing tissues as a part of a very critical examination of each mouth. We should have fixed in our minds the picture of the clean, healthy mouth in order that we may be able to recognize the slight deviations from health in the soft tissues, and that we should study out the cause of each area of inflammation and each decay. We will then be able, by the prompt correction of such causes—in most cases by the employment of properly planned and skillfully executed operative procedures, to maintain a larger percentage of mouths in good health to old age.

The technic of such methods is not to be presented here. The technic will vary much for different cases, but will consist for the most part in the maintenance of proper contours and contacts.

Pyorrhea Alveolaris, Alveolar Abscess and their Relations to Arthritis.

By Harry A. Goldberg, D.D.S., New York City.
Chief Dental Surgeon to the Hospital for Deformities and Joint Diseases and the Hebrew Infant Asylum of New York City.

The interest of the medical and dental professions has been keenly aroused in the past few years, to the systemic septic infections which may result from alveolar abscess and pyorrhea alveolaris. While this relationship is not new, it is only in the past few years that the dentist and physician have, through harmonious efforts, realized that the alveolar abscess and pyorrhea alveolaris might cause more than local manifestations of teeth and gum disorders. Heretofore the majority of dental and medical colleges have neglected to deal with the relationship between these diseases and systemic infections.

There has been a great deal of confusion about the use and meaning of the term pyorrhea alveolaris. Dentists have been using this expression as referring to the disease in its later stages, where it is already well developed, with its commonly known signs and symptoms, such as the exudation of pus from the pockets, the loosening of the teeth, bleeding, receding and sometimes hypertrophy of the gums at the gingival margin. The disease often is chronic, years elapsing before the presence of the pus is perceived by the dentist, physician or patient.

Recently a study of the conditions of the teeth and gums of sixteen hundred school children and children under school age was made by Drs. Williams, Rosenberg and Von Shelly, of the Research Laboratory of New York, with microscopic findings similar to those seen in the later stages of pyorrhea alveolaris. Pus cells in profusion were found in the scrapings from the teeth, near or under the gum margins, although pus was not perceptible to the eye; bleeding, receding, loosening and hypertrophy of the gums were found in a great number of these young children.

The Early Stages of Pyorrhea Alveolaris.

Now, when shall we say that this pathological condition begins? It is only a question of the *degree* of the development of the disease between that found in the mouths of many children and that seen in the mouths of adults. They are similar in their microscopic findings; but in the children the destruction is less extensive. There is still the question, when or at what stage does the involvement of the bony tissue of the alveolar process take place? True pyorrhea alveolaris would not be said to exist until such involvement took place, and would be as soon as it occurred. Are the smear findings in many of the children examined, which give a microscopic picture similar to many of the well-developed cases, merely the stages preliminary to the bone involvement of the alveolar process? Examinations of the scrapings do not tell. It could only be told by proper examination of the sections made across soft and hard tissues; but as this disease is not fatal in itself, it has been and will be impossible to secure such post mortem sections in its early and various stages.

Involvement of the alveolar process may occur *earlier* than a probe or scaler, passed to the part, would indicate. It is difficult to interpret delicate differences in X-ray pictures. As the pathological condition continues, destruction of the tissues increases, until the typical picture of the well-advanced stage, known to all, is reached. For the future prophylactic treatment (for all work in dentistry and medicine is tending toward preventitive methods) we must take into consideration the early age when this important disease begins.

Etiologic Factors in Pyorrhea Alveolaris.

Now as to the etiological factors which produce this abnormal state: Whatever may cause injury to the gums, to the connective tissue, or to the pericementum at the gingival margin may allow an opening for the *development* of the bacteria common in the mouth. Food, calcarious deposits, mechanical injury, whether from brush, toothpick, filoss silk, dental instruments, faulty fillings or crown and bridgework, may sever the continuity of the gums with the teeth; the resistance of the injured tissue being thereby lowered, an opening is made not only for the furtherance of the development of the organisms, but also for the continuation of that which first injured the gum tissue; tartar continues to form toward the root, food débris and organisms advancing with it. The destruction of the pericementum and alveolar process by the invading organisms naturally follow. These organisms with the leucocytes, which have been thrown out to attack them, form the pus in these now well-developed pockets. The alveolar process is

now attacked and frequently destroyed, because of the very nature of its structure, offering less resistance to the invading organisms than does the tooth.

It is very noticeable that in some mouths tartar forms very readily and quickly, while in others very little forms during a long period of time. As the hard tartar can be an important factor in the separation of the tooth from its immediately surrounding soft tissues, the quick formation of it in some mouths may act as a positive predisposing cause to future pyorrhea alveolaris.

Now, does not the chemistry of the saliva play an important part in the formation of the tartar? Little has been done in salivary analysis. Professor W. J. Gies, of the biochemical department of Columbia College, has been reporting some work done under him on the effect of saliva on the teeth. This work, which is extensive and most interesting, is still incomplete. Does not also the internal metabolism become an important factor in the changes in the saliva, as well as changes in the nourishment and resistance of the soft and hard tissues in the mouth? The internal metabolism is altered by the debilitating diseases, such as diabetes, Bright's disease, tuberculosis, etc. Therefore, it is only natural to find pyorrhea alveolaris as a not unusual secondary condition to these diseases. These diseases result in a lowered resistance of the tissues to micro-organisms, and so when the gums at their margins are injured there would naturally be a greater tendency to the formation of pyorrhea alveolaris. These diseases, by affecting the blood-vessel lining and nerve stimulation, may also interfere with the nutrition of the parts around the tooth. Further investigations are necessary to know the exact part and various changes in metabolism which these diseases take in pyorrhea alveolaris.

Little stress has been laid upon the micro-organisms of the mouth and the parts some of them play in the development of pyorrhea alveolaris and some of its sequellæ. Among the most common micro-organisms, found *even* in the healthy mouths, are the following: (1) Staphylococcus aureus and albus; (2) the streptococcus-pneumococcus group, especially the green colony-forming streptococcus, called the "streptococcus viridans," and the diplococcus, known as the "pneumococcus"; (3) the amœba; (4) the bacillus subtilis, known as the hay-bacillus. With the mouth showing some slight descent from normality, as thickened and receding gums, or where a perceptible pyorrhea may be limited to a single tooth pocket, there often can be found besides the above-mentioned micro-organisms: (5) A hemolytic colony forming strepticoccus, known as the "streptococcus-hemolyticus"; (6) Vincent's spirilum; (7) spirachætæ of

different sizes and variations and shapes; (8) leptothrices; (9) diptheroid bacilli (10) Gram negative bacilli, which sometimes are baccilus colli and sometimes not; (11) Gram negative diplococci are not unusually seen; they are not always micrococci catarrhalis.

Amœbæ.

The amœbic organism still need much further investigation. During the past year the amœbæ have received considerable attention. Barrett and Smith, Barret, Middleton and Evans, then Bass and Johns, made studies of many mouths, finding amœbæ always present in pyorrhea alveolaris, Bass and Johns first stating that "the amœbæ are not present in the absence of pyorrhea," that is, there are no amœbæ where there is no pyorrhea. I believe they have withdrawn from this positive stand.

Williams, Rosenberg and Von Sholly, in their study of the teeth and gums of school children, have found that the presence of the amœbæ are not uncommon in healthy mouths, that is, mouths which have proved to be in a healthy condition, even after the study of the microscopic findings.

Although the amœbæ have been imbedded in the tissues about the affected teeth, still with thorough and continuous destruction of them by careful treatment with emetin the existence and persistence of pyorrhea is not altered, as illustrated by 167 cases we tried out at the Hospital for Deformities and Joint Diseases. I cannot agree with the above-mentioned gentlemen that the amœbæ are the cause of pyorrhea alveolaris. That their presence may be an *exciting factor* in the continuance of the disease, that the organisms may take on a pathogenicity and finally secrete a toxin, considering the chronicity of the disease, cannot be denied as a possibility; but the same may be said of many of the other non-pathogenic organisms that are present in healthy mouths. May they not also, after a time, become pathogenic, or may not the altered conditions and the lowered resistance that gradually take place offer a better medium for the development of their pathogenicity? Investigators have not gone far enough to prove *exactly* the part that different micro-organisms take in the production and in the persistence of pyorrhea and also of its sequellæ.

Streptococcus Viridans.

The green colony-forming streptococcus, called the streptococcus viridans, has been shown not only at times to possess a strong pathogenicity when found in some of the abnormal conditions about the teeth and in the gums, but it also has been found in the blood stream, valves of the heart, and in the joints. Hastings, in his article on the "Streptococcus Viridans and Its Relation to Arthritis Deformans," has shown the relationship between the strain found in the alveolar abscess and pyorrhea pockets and the strain affecting the joints; not only were there posi-

tive complement fixation by the blood of the patient, using the organism found in the tooth as an antigen, but also the administration of vaccines made from the streptococcus viridans improved markedly the joint conditions of the patient. Rosenow has well illustrated the selective action of some organisms. He has shown it with the streptococcus viridans

Case 2, Fig. 1, upper and lower teeth before treatment.

from the teeth and gums, selecting the joints. These two gentlemen, as well as others who have worked on these problems, have shown that which my cases (whereof I shall speak later) also show, namely, the *close association* of pyorrhea alveolaris and alveolar abscess to arthritis. The alveolar abscess results from infection being carried through the canal beyond the apex into the soft tissues. This is so well known to this audience that it need not be dwelt upon here. *Still to be further investigated* is the theory that infections, like typhoid fever, diphtheria, etc., carry the micro-organisms to the apex of the tooth, through the blood stream or the lymphatics and that an embolism may be impacted there, cutting off the nutrition of the part, as well as disseminating organisms. It is common, probably the most frequent means, for the infection to reach the apex of the tooth because of the improper root canal fillings.

As stated above, the streptococcus viridans has been found by Hastings, Rosenow and others in the alveolar abscess as in the pyorrhea pockets. Arthritis is similarly associated with cases of alveolar abscess as it is with pyorrhea alveolaris.

Case 2, Fig. 2, lower teeth after treatment.

Case 2, Fig. 3, upper teeth after treatment.

Treatment and Cure of Pyorrhea Alveolaris.

Emetin treatment destroys the amœbæ, but does not cure pyorrhea alveolaris, while the following method will cure the condition without any special attention being given to the elimination of any one type of micro-organism.

Case 2, Fig. 4, X-ray before treatment showing tartar formation upper and lower teeth.

Treatment: (1) Sterilization of the hands and instruments; (2) Examination of the mouth, teeth and gums; (3) X-ray pictures to see just how and where the tissues are affected, so as to know how far into the alveolar process one must go for treatment; (4) Scaling of the teeth, care being taken to avoid severing the vessels entering the root canals; scaling between the bifucations of the roots, avoiding injury to the soft tissues; polishing of the teeth; (5) Injection of peroxide of hydrogen into the pus pockets to cleanse contents of leucocytes and organisms, dead epitheliel cells and débris. The oxygen gas given off by the peroxide of hydrogen does not injure healthy tissues, but will help to separate approximated pathological surfaces, thus allowing the medication that follows to reach all possible surfaces; (6) Ioline is next applied. This is forced

to the various parts by gently and carefully applying an air pressure apparatus. In order to increase the flow of the blood to the part and to stimulate the healthy tissue to form fibrous tissue which is supposed to take the place of the destroyed alveolar tissue in holding the tooth firm in its socket, the high frequency current is applied, special dental electrodes being used. X-ray pictures are taken before and after treatment. Sometimes it is necessary to take them in the progress of the treatment.

Case 2, Fig. 5, X-ray after treatment showing removal of tartar, and regeneration of tissue at the gingival margins.

Alveolar Abscess.

With alveolar abscess radiographs are also taken; this not only shows the location and involvement of the abscess, but also discloses any faulty filling which may have caused it. Apical obscess sometimes takes years to form, yet often is the direct result of improper root fillings. The root canal is opened through the apical foramen, allowing complete drainage of the abscess. Then the canal is sterilized and filled to the apex of the root, care being taken not to go too far beyond the apex in order to avoid a pericementitis, which may result from the

presence of the foreign body—the gutta-percha. After the extraction of several abscessed teeth filled by other dentists, I found gutta-percha extending from an eighth to a quarter of an inch beyond the root. This extension of the gutta-percha probably acted as an irritant. I find it best to fill the roots to the apex only. I wish to mention here what has been

Case 3, Fig. 6, showing gold crowns on four upper front teeth, with abscesses on left central and lateral and right lateral roots. The left central root has gutta percha, which does not extend to the apex of root.

seen so often in the pictures I have taken, that where the dowel or pin has been used the apical end of the canal has not been properly or completely filled, resulting in the development of an abscess. Care should be taken in doing this work to see that the apical end of the root is sterilized and filled before cementing in the appliances.

The following cases observed at the Hospital for Deformities and Joint Diseases, and referred to me by the chief of the staff, Dr. Henry W. Frauenthal, and his associates at the hospital, were treated by me with the most gratifying results. I cite these cases to call your attention to the teeth and alveolar infections as a source of joint trouble.

Case No. 1. Mr. F. H., age forty-six years, born in the United States. History negative; blood negative.

Present history: For the past three months patient complained of pain in both insteps and both ankles. The swelling was present when the condition first appeared, but this had gradually subsided. The patient saw his physician, who diagnosed the condition as rheumatism, and prescribed internal medication and advised special diet.

But this failed to relieve. The pain was so severe in both feet that the patient found it difficult to stand for any length of time. Diagnosis of the oral cavity showed a very severe case of pyorrhea. The teeth and gums were treated, and in a week's time the pain in the feet disappeared; at the end of the second week the patient was able to return to work.

Case No. 2. L. D., age fifty-five years. Born in the United States. History negative; blood negative. Occupation, butcher.

Present history: First complained of pain in both ankles fifteen years ago. One night the patient felt something wet in his shoe, and upon removing same saw blood on his stocking. He visited his physician, who, upon examination, stated that he had ruptured a blood vessel. The doctor bandaged foot, and the following day the patient could not walk; the following day the bandage was removed and he went back to work. Within the past year the pains became so acute that it made walking practically impossible. Dr. Henry W. Frauenthal diagnosed the case as arthritis deformans, due to pyorrhea, and referred the case to the dental department. Upon dental examination I noted a severe pyorrhea. The teeth were thoroughly cleaned and the gums treated, with the following results: The first day the patient could only walk twenty-five feet; within three weeks he could walk half a mile, and two weeks later could walk a mile. Photographs and radiographs before and after treatment are shown herewith (Figs. 1 to 5).

Case No. 3. Mrs. Y. W., age forty-two, born in the United States. History negative; blood negative.

Present history: First noticed severe pain eight months ago in both shoulders and left knee. The pains gradually grew worse and she saw a physician, who, upon examination, said she was suffering from rheumatism and put her on a diet, advising anti-rheumatic medicines. She used same with no avail; the pain gradually grew worse, affecting all the joints. She was referred to the Hospital for Deformities and Joint Diseases. Upon examination the patient was referred to the dental department. The patient came under my observation February 5th, 1915, presenting the following: No pyorrhea, but gold crowns on the four upper front teeth. A radiograph was taken (Fig. 6), disclosing improper root fillings in upper left central, an abscess on left lateral root and right lateral tooth. Crowns were removed, the abscessed teeth extracted and within twenty-four hours patient felt relieved. The day following, patient returned and she felt entirely recovered. I saw her two weeks later and there were no signs of any relapse of the arthritis. This illustrates that with the removal of the teeth beneficial results came

more quickly, but good results can be obtained slowly by draining through canals, thus saving the teeth.

Case No. 4. Mrs. A. H., age forty-nine years, born in England. History negative; blood negative.

Present history: Patient first complained of headaches five years ago, then pains in the knees and her hands would swell very often. She saw a physician who told her she was suffering with rheumatism and referred her to the hospital. Upon examination the

Case 5, Fig. 7, showing bridgework with abscessed roots impacted.

patient was referred to the dental department for treatment. Radiograph showed abscessed teeth due to improperly filled root canals and pyorrhea. Her pyorrhea was treated, the bridgework removed and roots treated, and at the end of the third week all pains disappeared. Have seen patient every week for four months, and there have been no signs of any relapse of the arthritis.

Case No. 5. Mrs. S. M., age fifty years, born in Germany. History negative; blood negative.

Present history: For the past two months patient has been suffering in the right and left shoulder, elbows and legs. Her pain became very acute and her physician, after an examination, referred her to the hospital. She was referred to the dental department and X-ray taken, which showed a bridge extending from the lower right to the left lateral imbedding the central roots which were abscessed. The bridge was removed, roots extracted, the pain disappeared within twenty-four hours; here also getting a quick result. I saw the patient two months later and there were no signs of any recurrence of the joint trouble.

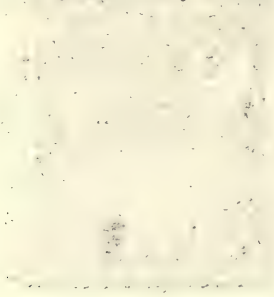
In conclusion I would say that:

(1) Pyorrhea alveolaris and alveolar abscess can cause systemic infections.

(2) Radiographic examinations are essential for diagnosis and treatment of pyorrhea alveolaris and alveolar abscess.

(3) Further investigations are necessary for the understanding of the etiological factors of these two conditions. Not only the bacteriology and chemistry of the environments of the parts, but also the effect of the metabolic changes.

(4) Physicians should examine condition of gums and teeth so as to recommend the patient if necessary to the dentist for treatment.



Cavity Preparation for the Gold Inlay.

By J. V. Conzett, D.D.S., Dubuque, Iowa.

The study of operative dentistry has its beginning in the science of cavity preparation. It is the foundation of the art of filling teeth, and in proportion to its proper understanding and use by the operator, will be his success or failure in repairing the ravages of decay, and preventing a recurrence of the same.

The gold inlay, as it has been given to the profession by the genius of Dr. W. H. Taggart, has become the accepted method of restoring lost tooth structure with gold, having very largely displaced the older and more arduous method of the malleted filling, especially in the large cavities in the molar and bicuspid region. Its comparative ease of manipulation has, however, been the cause of many failures, for the man who has not fully grasped the significance of the inlay and its technique, and who has thought that it is an easy way to success, has had a rude awakening by the failures that have come to him. These are entirely unnecessary, and are a result of his failure to grasp the underlying principles needed for a perfect inlay. A perfect inlay can be made, but in order to do so there must be, first, a proper cavity preparation; second, a proper wax and manipulation thereof; third, a proper investment, burning out and casting, and fourth, a proper cementation and finishing. With the last three propositions your essayist has nothing to do at this time; it is his province to lay the foundation in giving the principles of a proper cavity preparation, and in the limited time at his disposal, this must be of the most elementary character, and must deal with principles rather than with many concrete examples. We shall attempt, in a hurried manner, to throw upon the screen, after the completion of the essay, some illustrations which will more clearly elucidate the points we are attempting to make.

General Principles of Cavity Preparation.

The preparation of the cavity is fundamentally the same, no matter what may be the material with which the cavity is to be filled. There may be, and are, some modifications as the exigencies of the material or the method may demand, as for instance,

in the making of a cavity for the reception of a gold filling it is permissible to make some retention in the shape of a slight undercut, which is obviously impossible in the preparation of a cavity for an inlay, and in the preparation of the cavo-surface angle of a cavity for a gold inlay, it is proper to use a beveled margin, which is decidedly contra-indicated in the making of a cavity for the reception of a porcelain inlay, but in all of the fundamentals the preparation of a cavity is the same, and must follow out the same general principles.

The dental profession owes Dr. G. V. Black so much along every line of professional endeavor, that the debt can never be paid, but, to me, there is no place where we owe him more than in the order he has given us in his system of cavity preparation, and that which I shall give you at this time is entirely based upon the methods he has given us in his great work on operative dentistry, modified to meet the requirements of the cast inlay.

Dr. Black says:

First—Obtain your outline form,
Second—Obtain your resistance form,
Third—Obtain your retentive form,
Fourth—Obtain your convenience form,
Fifth—Remove any remaining carious dentine,
Sixth—Prepare your enamel wall, and
Seventh—Make the toilet of your cavity.

In this essay we will follow the line he has indicated as the most rational procedure which has been given us.

The Outline Form of Cavity.

The outline form contemplates the extension for prevention and the esthetic form.

Extension for prevention is the carrying of all lines of the cavity into areas of comparative immunity to decay. All operators who are observers at all, know that there are certain parts of the surface of the tooth that harbor the beginnings of decay more than other parts and that there are surfaces that rarely or never have upon them the beginnings of decay, unless the tooth is malposed, when the surface indicated is really in susceptible territory by reason of its malposition. It is only reasonable then to place the margins of the finished filling in the areas that are not susceptible to the beginnings of decay, for in so doing we are obviating the danger of a recurrence of decay around the filling. The territory that is comparatively immune is that which is automatically kept clean by the excursions of the food in mastication and the movement of the tongue and lips.

The susceptible areas are those that are not so cleansed and which

lie in contact with food débris which is not removed by toilet methods. Such areas are the approximal surfaces of all teeth and the gingival thirds where the occlusal-gingival curvature is great enough to cause the bolus to pass over this area without the scouring action that it exerts upon the surfaces of the teeth with which it comes into immediate frictional contact.

In addition to these smooth surface territories there are the susceptible areas involved in the defects of the teeth in pits and fissures that have not been prefectly calcified. In order to protect the filling or inlay then, it is necessary to carry the margins far enough gingivally so that it will lie under the gum margin; far enough buccally and lingually so that it will be out of the embrasure enough to be cleansed by the scouring action of the food in mastication, and on the occlusal surface must be carried into smooth areas. That is, all fissures must be carried out as far as they go and the margin of the cavity be made in the smooth surface beyond the fissure. If the filling or inlay is well made, recurrence of decay does not take place within the territory between the filling and tooth. It is not infiltration decay, but begins by the deposition of a bacterial plaque immediately contiguous to the filling upon the enamel margin, and no matter what the material that is used to fill the tooth may be, whether it be gold or amalgam, whether it be a gold or porcelain inlay, if the bacteria of decay can attach themselves and remain unmolested near a filling or inlay, if the person is susceptible, decay will recur.

So in all cases place the margins of your cavity in the area of comparative immunity.

Esthetic Form.

The esthetic form is that which will make for the greatest beauty in the finished inlay. All lines that are exposed to view should be gently curved. Angles should always be avoided as should sharp curves. A round filling would look almost as badly as a square one, so the lines that are visible to the eye should neither suggest a square nor a circle. Nature being the great artist should be the model in all of our work and the lines she lays down in an individual case should be very closely followed. It is a good plan in the building of a filling where a great deal of the tooth structure has been lost, to keep the corresponding tooth on the opposite side of the jaw in view and use it as a model, in restoring the tooth upon which you are operating. In making a restoration always restore the contour and shape of the tooth, for no matter what may be the material with which the restoration is made, if the shape has not been properly restored the effect will be decidedly unesthetic.

Resistance Form.

The resistance form must be made broad and deep enough to withstand all of the stress that may come upon the finished product. It is impossible to lay down any hard and fast rule, for we do not know just how much stress every filling will have to resist, so that every case will have to be studied by itself and sufficient resistance form made for that individual case. All of which leads us unerringly to the oft-repeated injunction to *"study conditions."*

In order to be successful in any line of endeavor we must know the conditions under which we are to operate, and if we are to be successful in the saving of teeth from the ravages of decay we must have an intelligent conception of the conditions of health, the function of the normal mouth and teeth and must then know its pathology that we may be able to correct the diseased condition and restore function. In the filling of teeth we must get away from the idea of simply saving the tooth. We must have a broader conception and consider the tooth in relation to the tissues of the whole mouth and its function as a masticatory organ. To do this we must study the condition in which we find the tooth upon which we are to operate. Know the approximate masticatory stress that the filling will have to endure, the lines of force and the direction of the same in the case under consideration, and any abnormality that may exist in the occlusion. The operative dentist as well as the orthodontist and prosthodontist must study the occlusion of the normal denture that he may not only reproduce the same, which is of prime importance, but that he may also recognize any abnormalities in any case that comes under his observation, that he may correctly deal with the same.

The resistance form should be made with a flat seat, for we know that a flat foundation will resist stress without any tendency to displacement better than any other form. The resistance form is that form that is given to a cavity that will tend to resist the thrust forces that will come upon the finished product; and in making this preparation this truth must not be lost sight of.

Retentive Form.

The retentive form is that form that will tend to resist the pull forces that would lift the filling out of the cavity.

The best form to prevent such displacement in the inlay is the box shape, in which we have flat seats and parallel walls. In the making of a filling it is permissible to have some undercuts and have the retention made with a greater internal area than an external one, but this is obviously impossible in the preparation of a cavity for an inlay, for a cavity so made would render it impossible for the wax

to draw or the inlay to go to place if it were possible to make a model of the cavity. It is then necessary to find a preparation that will sustain the stress of mastication and yet have no undercuts. We have found to our sorrow that there is no cement that will sustain the burden without some mechanical help, but we may so assist the cement that a perfectly secure operation may be made. In order to do so we must give the inlay the greatest frictional resistance that it is possible for us to obtain. As the undercut is denied us the next best is the wall that is absolutely parallel. The closer we approximate the parallel the greater will be the frictional resistance and in proportion as we depart from the parallel will be the percentage of our failures through the inlay falling out of the cavity, and as the cry is going up all over the land at this time that the inlay is failing through its failure to maintain itself within the cavity, the emphasis upon the obtaining of sufficient retention in the preparation of the cavities made for the inlay is most timely.

In order to make a cavity that will have the maximum of frictional resistance we will need to cut it deep enough to give the inlay sufficient body to have a grasp upon the walls of the cavity. Most of the failures I have seen have been because the cavity was not made deep enough. Most of them were scarcely cut through the enamel. It is impossible to make any definite rule concerning the depth of the cavity, but I would not make it any more shallow than one millimeter nor any deeper except in rare instances, than two millimeters. A greater depth than that is not necessary for the retention in most cases and a greater depth will unnecessarily encroach upon the pulp and cause a thermal discomfort.

In the approximal cavities in bicuspids and molars, we obtain an additional retention through the making of an occlusal step; this coupled with the cavity in the axio-proximal surface of the tooth makes a very strong and resistant cavity, and I have rarely seen an inlay made in such a cavity, particularly if the occlusal step was made sufficiently deep, fail by reason of it coming out of the cavity. The making of the cavity in the shape of a cone with the lines converging toward the gingival margin cannot be too severely condemned, for it invariably invites failure. First by reason of the fact that it has not sufficient frictional resistance and second because a cavity so made causes the linguo- and bucco-gingival angles to be too far within the embrasures, and consequently within the area of susceptibility, and thus invites a recurrence of decay at these points.

Convenience Form.

The convenience form in the preparation for the inlay is not so necessary as it is for the gold foil filling, for with a foil filling it is necessary to so make the cavity that all of the cavity will be within

the reach of the plugger point, for you cannot condense gold around a corner. With the inlay it is different; you can cement an inlay in any cavity of which you can make a model, so it is only necessary in the convenience form for the inlay to make the cavity sufficiently accessible to properly introduce and trim your wax. It is permissible—nay, advisable—to cut out sufficiently far to enable you to make a perfect restoration. Where to cut and where not to do so it is not possible to say, for a cavity that is easy for one man will be impossible for another of equal skill. The only rule that we can lay down is always to so make the cavity that you can perfectly fill it, for no matter how perfect may be the preparation from a scientific standpoint, if the cavity is not perfectly filled and the fluids of the mouth and contained organisms thereby excluded, the filling will be a failure.

Removal of Carious Dentin.

Remove any remaining carious dentine. This rule for the filling, is in place for the making of an inlay, of course, for the cavity must be perfectly cleared of all decay, but it is often better to leave the removal of the remaining decay until after the making of the model, for in removing the decay we will often make an undercut that will prevent the making of a model, and while this defect can be remedied by the insertion of some cement in the undercut, it is not necessary if we make our cavity of the proper form and leave the residual decay for removal after the making of the model; then, if there is an undercut, it will do no damage, but will, on the contrary, be of advantage in the retention of the cement and consequently, the inlay. But the decay must be all removed. It is not safe nor honest to leave any and trust to the cement to cover up our negligence. Decay is always a menace to the health of the tooth and the life of the pulp, and the utmost care must always be observed to entirely eliminate every particle of it.

The preparation of the enamel walls is the most important part of the preparation of the cavity, for it is here that the safety of the filling exists. If the preparation of the cavo-surface angle is not properly made, the chance for permanent success is infinitely less than if they were properly prepared.

Beveled Margins for Inlays.

We believe in the beveled cavo-surface angle and we think that we can give a reason for the belief that is in us. In the first place we bevel the enamel margins all around the cavity for the purpose of protecting the enamel rods. We know that enamel is one of the most resistant tissues of the body when the continuity of its rods is unbroken, but we also know that once broken, by

reason of their histological structure, the rods immediately approximating the break will have a tendency to fall out and do so under the slightest stress. We also know that the arrangement of the rods is such that when they are cut in certain directions there are left an exceedingly large number of short rods whose ends do not reach the dentine, and are left in an extremely weakened condition. The beveling of the margins of the enamel cuts out these short rods and leaves the enamel margin in the strongest possible condition to withstand the stress of mastication. Again in the making of the cavo-surface angle bevel we make possible the casting of a flange upon the margin of the inlay which may be burnished to perfect contact with the tooth immediately after cementation and before the cement has begun to crystalize, thus making the most perfect fit that is possible.

The bevel may be made by the use of the "Black" marginal trimmers and in the case of an inlay should be the depth of the enamel. This greater depth in the inlay than the filling is for the purpose of having a longer flange cast upon the inlay, thus making the burnishing of greater efficiency. A long obtuse bevel is not to be recommended, however, for it involves a long thin flange which will have a tendency to curl up away from the tooth under stress and thus make a vulnerable point in the otherwise perfect inlay.

Toilet of the Cavity.

In making the toilet of the cavity all débris must be perfectly eliminated and the dentinal walls left clean and pure. In making a gold filling where the rubber dam has been in position during the preparation of the cavity, and until the completion of the operation, it is only necessary to thoroughly cleanse the cavity with hot air blast or cotton to perfectly remove the dry powdered remains of the dentin and remnants of decay, but with an inlay preparation where the cavity may have been prepared without the rubber dam and the patient dismissed until a later day for the cementation, the case is entirely different. In such a case the cavity should be thoroughly washed out with a blast of warm water and then dried and a dressing of the oil-of-cloves sealed into the cavity and the patient dismissed. When the inlay is to be set the tooth should be isolated with dam or cotton rolls and the dressing removed, the cavity washed out with alcohol, dried with hot air and the inlay cemented to place. If this is not done and the organisms of the mouth are allowed access to the cavity during the interim between the making and the setting of the inlay, or if there has been placed a filling of gutta-percha in the tooth over organisms that have obtained access to the cavity, the chewing upon the temporary filling will cause a pressure that will force the bacteria into the dentin, possibly into the pulp

and we will have a decidedly sensitive cavity to deal with if nothing worse. The oil-of-cloves is an antiseptic anodyne, and while protecting the dentin and pulp from bacterial invasion at the same time acts as a sedative to the pulp, and if the cavity is well sealed will cause the tooth to be in better condition upon the return of the patient than it was at the first sitting.

Cavity preparation is not all of the art of restoring lost tooth structure with the gold inlay, but as we have said it is fundamental, and if well made can then be consistantly followed up by the making of the model, investing casting and cementation. Each step must be carried out along the lines that have been worked out for their several portions. If each part is well done the resulting inlay will be perfect in its fit and will cling to the tooth with such tenacity that only the force that will break the tooth will be sufficient to dislodge it.

An Informal Talk on Inlays.

By E. S. Tracy, D.D.S., Brockton, Mass.

The use of the gold inlay has come to be such a familiar part of our daily practice that it is superfluous to speak of its necessity or of its great utility. It has taken from our shoulders the burden of many of our former tedious and difficult operations and has rendered possible the establishment of approximately perfect results in the line of high grade dental operations.

No one can successfully refute the statement that pure gold skillfully used is our best permanent tooth preserver. When we consider strength, adaptability, wearing qualities and appearance we turn to gold as the most reliable material.

Whatever arguments may be advanced regarding the use of other materials in the anterior teeth, beginning with the distal surface of the cuspid and going back, we like to see substantial, nicely finished gold work. It is here that the gold inlay proves itself most beneficial, and I wish to speak of some of the detail of bicuspid and molar inlay work.

In proportion as a tooth of either of these forms is badly broken down the use of the inlay finds greater scope.

For many years previous to the introduction of casting gold it was my custom to use cohesive foil for the filling of most cavities in the bicuspids and molars, from those of small extent up to those of larger area and calling for long and tedious operations. The mouths of many of my patients contain gold restorations in the approximal surfaces of each tooth from cuspid to third molar; however, the inlay method has now taken the place of a large part of this work, and has become a very valuable and necessary part of present-day practice.

In discussing this subject, the conditions and indications for the insertion of inlays should first be considered. Cavities in occlusal surfaces are ideal situations for inlay work when not very small, and complicated shape, of course, makes no difference. These cavities are readily filled with foil, but an inlay is certainly easier, and especially so as we go toward the back of the mouth.

The occlusal cavity is not so frequently in evidence as those upon the approximal surfaces, and it is with this class that this paper will especially deal.

The contact point and its immediate surroundings are very important considerations to the operative dentist and the call for their restoration is imperative and extremely frequent.

Preparation of Cavities for Inlays.

In practically all approximal surfaces it is necessary to so prepare the cavity that it extends into the occlusal surface, making it compound. In preparing the cavity it is best to extend the buccal and lingual margins well out toward their respective surfaces for prevention of further decay. The gingival margin is carried to the gum line and often slightly below, or to the extent of the cavity. The gingival wall is left flat with slightly beveled edges, the side walls being parallel, and this angle is usually kept throughout the extent of the cavity.

It is necessary in nearly all cases to cut out the sulcus in a bicuspid and enlarge the pit on the opposite side to form a step, or dovetail, for retention, and when the cavity extends over both approximal surfaces the detail is the same, though greater in extent.

I use stones a great deal for cutting the enamel and opening up the cavity and find that a disk is a good instrument for truing up and giving the final finish to the side walls.

In the molars the preparation is about the same except in the occlusal surface, where any linear decay should be followed out and a retentive form given to hold the inlay firmly.

In buccal, or occlusal cavities, which are confined to one surface, a flat floor should be left and the walls should be parallel as before stated.

Matrix for Making Wax Pattern for Inlay.

In making the wax pattern from which to construct the inlay, a wax which can be warmed and softened by dry heat and will work readily in the fingers is preferable. This is prepared and a conical piece somewhat larger than the cavity is pressed firmly to place. If a matrix is used, care should be taken that it is not too tight about the margins of the cavity; by leaving a slight looseness the tendency of the wax is to press out a little beyond the cavity margins and it is important that it should do so.

A flexible matrix is best, as then the patient can close the jaws while it is still in place, thereby registering the occlusion. When the matrix is not used, so much carving is necessary that the labor is greatly increased

without corresponding increase in value. I nearly always use one for approximal cavities and prefer celluloid confined by a little clamp, which does not interfere with the occlusal surfaces of the teeth.

After getting the wax thoroughly into position and taking the bite, the matrix is removed, the wax trimmed slightly and smoothed at the margins and chilled with cold water. If the cavity is large, carve out the wax from the interior of the model with a suction carver before casting, to allow a thicker layer of cement to remain over the pulp.

Removal of Wax from Cavity.

The removal of the wax from the cavity is a very important detail. This should never be done by prying, nor by any other motion than a straight pull, with perhaps a slight rocking to start it. My experience has convinced me that the best method is to take a slender copper wire, hardly larger than binding wire, of about three inches in length, and heating one end in a flame to plunge it into the wax inlay at any convenient point. When it cools, a handle is formed which will invariably unseat the wax, provided the cavity is properly shaped. If it will not do so, there is an undercut in the cavity which ought not to exist. This wire also serves to hold the wax inlay while the sprue of the casting device is inserted.

Overlapping of Margins.

The object in leaving an overplus of wax at the cavity margins is one of the most important factors in the operation, for if the wax is left flush and exactly even with the outer edge of the enamel of the cavity margins, the inlay will prove too small for two reasons. First, because it must be finished and polished after the gold casting is removed from the flask, thereby losing some slight amount of gold. In the second place, there seems to be no casting machine perfect enough to exactly duplicate the wax model in size. It may closely approach perfection, but there is a shrinkage, although measured, perhaps, in ten thousandths of an inch. This shrinkage taken with the amount lost in finishing, is enough to result in an exposure of the extreme edge of enamel margin and is a consequent invitation to trouble. The gold of the finished inlay should come slightly beyond the edge in order to secure the best protection. By leaving in the wax pattern a little overlap at the margins, enough gold is provided for shrinkage, for finishing and for burnishing.

Pure gold is generally used for casting. After the inlay is cold, finish and polish. A carelessly finished inlay is inexcusable, as there is every opportunity to secure both a perfect surface and a mirror-like polish over every atom of the surface.

Finishing Inlays.

It sometimes happens that in trying in the completed inlay, I find that I have not judged exactly in regard to the proper amount to remove from the margins and this fine adjustment would better be left until the patient is in the chair, and the inlay can be tested many times if necessary. A delicate, thin edge of the finished inlay should slightly overlap the margin, making it very tight. It can be burnished down to a perfect adaptation.

Area of Contact.

Another point should be emphasized. The normal contact point is very small. This fact is frequently lost sight of in operations of restoration, and although the inlay may touch the adjacent tooth, it is often by a surface of comparatively large dimensions. An ideal contact point can be secured by flowing on a little solder at the proper place, and rounding it up to a little ball, or dome. A very important procedure also is a careful carving of the wax inlay on its occlusal surface, restoring the original form of the cusps and occlusal planes, as without this being done even though your contact point is perfectly restored the results will be far from satisfactory.

Field of the Gold Inlay.

The field of the gold inlay is a large one. In our present practice we are going far in advance of the inlaying, in the strict sense of the word, of a piece of gold in some surface of a tooth, and are proceeding to the supplying of absent corners, and to the successful restoration of half, or even the whole, of the crown of a tooth. Extremely large restorations may be made without removing the pulp, as by the use of suction carving, the gold, though large in surface area, may be comparatively thin, and the pulp carefully covered with a thick layer of a safe non-conductor.

(The *direct* method of making inlays is the one discussed in this paper. The *indirect* method, whose technique I have no time to go into, is preferred by some operators, and skillfully employed, may produce equally good results.)

A very important field for inlay, or restoration work, is in lengthening teeth which have become worn or abraded, for the purpose of opening the bite, and restoring articulation. In making this class of inlays, 23½-kt. gold alloyed with platinum should be used, as it resists wear much better than pure gold. Two or three pins perfect the retention, and most satisfactory results are obtained.

Very durable and artistic results can be obtained in the approximal

surfaces of the anterior, bicuspid, and occasionally even the first molar teeth, by the gold inlay combined with porcelain or some good silicate cement. With a suction carver remove from the wax inlay the portion which would show, and replace same with well-matched porcelain or cement. In the finished inlay a thin cutting edge of gold should always be left as otherwise the porcelain or cement might be fractured during the process of mastication. I have for the last two or three years, used this method in cavities of this character, with gratifying success.

The Restoration of Masticatory Function with Carved Gold Inlays.

By Rodrigues Ottolengui, M.D.S., L.L.D., D.D.S., New York City.

Perhaps the most important subjects attracting the attention of advanced dental thinkers to-day, are (a) body diseases which may be attributable to septic conditions within the mouth and about the teeth; and (b) prophylaxis.

In connection with the latter term, I believe that the profession is restricting it to too limited an area both in thought and in practice. Admittedly or otherwise, those that speak of prophylaxis, in the majority of instances, are not thinking so much of the prevention of disease, as of the prevention of that particular disease known as pyorrhea alveolaris. There is even a further limitation of thought, because usually in advocating a means of producing this prophylaxis, the disciples of this propaganda appear content to confine their description of methods of treatment within the general scope of mouth hygiene.

To express this otherwise, prophylaxis appears to have been given the limited meaning of the prevention of pyorrhea alveolaris, and treatment to have been restricted to the technic of producing and keeping a clean mouth.

No one will doubt the fact that where a patient presents with a foul mouth and the early stages of pyorrhea, the treatment by the dentist will be greatly aided by inculcating a cleanly mouth habit on the part of the patient. Yet it is confusingly true that in many unclean mouths we do not find pyorrhea alveolaris, nor any other septic infections. Why?

The classic postulate in regard to all infections is that, the nature and extent of the infection will greatly depend upon (a) the dosage, or number of the germs; (b) the virulence of the germ; and (c) the vital resistance of the patient. And the last of these factors is the most important, because even though the invaders may be both numerous and virulent, if the host enjoy a powerful vital resistance the invasion will be overcome.

During the last bad epidemic of cholera in Europe, in order to

establish the truth of this axiom a courageous young physician visited regions where the plague was worst and without precautions of any kind ate and drank of food and water that had been exposed to contamination, yet his digestive organs easily resisted the disease breeding germs.

Is it not probable then that when we see a foul mouth which is nevertheless free from septic disease, we may attribute the man's immunity to his perfect digestion, which of course means a perfect or nearly perfect metabolism?

I am by no means wishing to imply that it is unnecessary that the mouth should be kept clean, but I would call attention to the fact that even a clean mouth may be open to infection, while an unclean mouth may be immune, the difference depending upon the relative vital resistance of the two individuals.

This vital resistance I think may be easily traced to a proper functioning of all the organs of digestion, and of primary importance in this cycle are the masticatory organs, the teeth.

I need scarcely even remind you of the fact that food properly masticated is half digested. We all know this, yet I fear that because we have so many teeth, we have overlooked the tremendous importance of keeping each and every tooth of proper size and form.

In the past we have laid too much stress upon the stopping of decay, and the prevention of the recurrence of decay, and have given too little thought to the restoration of tooth form, that the masticatory efficiency of the teeth, especially of bicuspids and molars, might be at the maximum.

Incorrect Filling Responsible for Septic Conditions.

I believe firmly that the incorrect filling of teeth in the past has contributed largely to the prevalence of septic conditions within the mouth, more particularly in two ways. First; by a lack of proper restoration of the occlusal surfaces of molars and bicuspids, the masticatory efficiency has been impaired, and the vital resistance of the patient has been reduced in exact proportion with the loss of masticatory power. Secondly; by incorrect or inadequate approximal contacts, added to the absence of correctly formed mesial and distal marginal ridges, food, instead of being kept out of the approximal spaces, has actually been driven between the teeth and even retained in these spaces. As a result, of course the easily injured septal tissues have been driven back, thus increasing the space, inviting the lodgment of larger masses of food debris and eventually resulting in septal infections.

Very much has been said, and well said in the past about the importance of proper contact points, and the disastrous consequences which

might follow incorrect work in this region. But one of the main objects of this paper is to point out, that the construction of correct approximal contact alone, will not suffice. Teeth are not so rigidly held in their bony sockets, that food may be excluded merely by shaping a filling so that it shall lie in close approximation with its neighbor.

To fully protect the sensitive interproximal tissues we must arrange for the exclusion of food by providing sluiceways through and out of which food may be driven more easily than it could be forced between the teeth.

The Study of Tooth Forms and Functions.

To accomplish this we must study nature and we must copy nature. In undertaking this study of tooth form, that we may copy tooth form, and thus restore the highest efficiency of mastication, while at the same time protecting the subject from onsets of septic diseases, I recommend that the student select for study the most typical teeth, with the longest cusps and best defined sulci that he may be able to find. It will indeed be difficult to comprehend the true meaning and purposes of the cusps, sulci, grooves, inclined planes, and marginal ridges, unless we do confine our attention at first solely to teeth in which all these characters are well defined. Again, even after we arrive at a full comprehension of the purposes of the various aspects of the occlusal surfaces, we may find it hard indeed to discover a set of teeth in which the natural teeth would be sufficiently well formed to substantiate the argument. This is true because whatever may be the highest type in any created animal, various causes, acting through ages of generations have brought us to the point where aberrations are more easily found than the truly typical.

Nevertheless, if we do find a well formed set of teeth with long cusps and well marked sulci and marginal ridges we can easily see the intent and object of these forms, even though we cannot find the acme of type. And once we have comprehended the purpose of cusps, sulci, and marginal ridges, we can supply these in carving inlays so as to create for our patient the highest efficiency possible with a repaired masticatory unit.

In Figs. 1 and 2 we have before us the occlusal surfaces of an upper set and a lower set of teeth, in which the cusps, sulci and marginal ridges are sufficiently well marked for study purposes. Fig. 1 shows the occlusal surfaces of an upper set of teeth. Note particularly the fact that all the sulci are sharply defined, and that they appear as "V" shaped whereas in nearly all swaged crowns, and even in the majority of so called carved gold inlays these sulci are "U" shaped, or rounding at the bottom. The normally formed sulcus will remain distinctly "V"

shaped, or pointed, at the bottom, even when long attrition has effaced the greater part of the cusps. An examination of Indian skulls will show hundreds of full sets of teeth, worn away until all semblance of cusp formations have been obliterated, yet these sulci persist. This

Fig. 1.

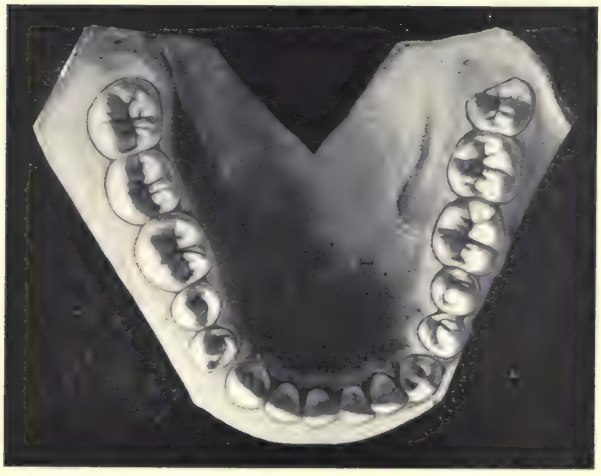


Fig. 2.

should prove that they serve an important purpose, which probably is to hold the food during the act of trituration. Above all things then these sulci should be sharply defined in our inlays. To this end warning may be uttered against too free use of solvents in polishing the wax pattern, and also careless use of polishing instrument during the finishing of

the inlay. Personally my preference is to finish my inlays with tantalum burnishers, some of which I have altered to hatchet shape, using the edge for smoothing without obliterating the sulci.

Even more important than the shape of the sulci is their position and purpose. In Fig. 1 observe the sulci radiating from the mesial half of the upper first molars, and it will be seen that a very pronounced arm crosses the buccal ridge, dividing this ridge into the mesial and distal buccal cusps respectively and passing over into the buccal groove.

Fig. 3.

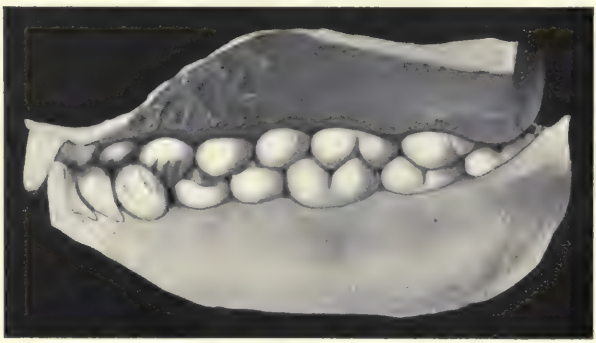


Fig. 4.

In similar fashion we have an extension of the distal sulci crossing the palatal ridge, again dividing the ridge into cusps, and passing between them into the palatal groove. Next examine the mesial and distal marginal ridges, and we find that these ridges are fairly erect outwardly, or towards their approximating neighbors, whereas, they slope sharply away from their neighbors and towards the center of the tooth, thus forming inclined planes. These planes terminate in sharp pits from which radiate two arms of a "V"-shaped sulcus, which lead buccally and lingually of the actual area of contact. This peculiar combination of a plane which inclines away from the point of contact, with the two sulci which lead buccally and lingually away from the contact, affords an opportunity for food to be forced, away from the interproximal space, and secondly supplies sluiceways that allow the exit of the crushed food buccally and lingually of the contact.

The formation of these inclined planes and sluiceways are usually best distinguishable in the distal margins of the lower first molars, which explains why these teeth in effect have five cusps.

Fig. 3 is from a section taken distally of the upper first molar and distally also of the lower first molar, the distal surfaces of the two teeth being shown. Here we can note the occlusion of these teeth and we see how the sulci passing buccally and lingually of this marginal cusp of the lower molar serve as sluiceways for the food to pass away from rather than between the contact points.

Fig. 4 is a section showing the occlusion of this set of teeth as dis-

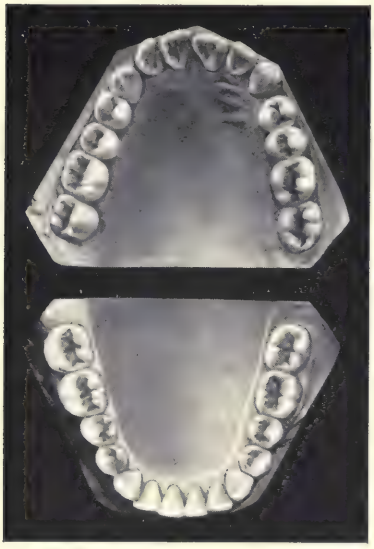


Fig. 5.

Fig. 6.

closed by a study of the lingual aspect. Here we note that such is the nature of normal occlusion and such the purpose of the sulci which pass lingually, that the crest of each molar interdigitates directly against a lingual sluiceway, except where the cusp occludes between two opposing teeth. And here it is that we see the great importance of the marginal ridges, with the sulci passing buccally and lingually of the area of contact, as otherwise these powerful cusps must drive the food between the teeth and into the interproximal space, causing great injury to the septal soft tissues. At the most vulnerable point, the space between the lower first and second molars, observe that the lingual arm of the marginal sulcus leads the food into the mouth away from the contact point.

Importance of Contact Points.

While enlarging here upon the importance of correctly forming the mesial and distal marginal ridges, with their inclined planes, and sulci radiating buccally and lingually into the mouth, we must not

belittle the value of the contact itself, for manifestly if we do not supply contact, or if we form it incorrectly, food will readily be forced between the teeth. Indeed so important is this subject of contact that I cannot too strenuously recommend a complete restudying of the formation thereof, for I am moderately sure that many men have erroneous conceptions thereof. I doubt not that many men mentally conceive little difference between the form, size and position of the areas of contact between bicuspids, and between molars. Moreover, I fancy that many men think of these contacts as of the contact between two marbles. One has but to glance at Figs. 1 and 2 (or any skull containing complete dentures) to see that this notion that contact points are spherical in form, or similar in all situations, is entirely wrong. For example, in Fig. 2 note the contacts between the molars, and compare with the bicuspids.

True prophylactic demands therefore must cause us to carve our bicuspid and molar inlay restorations so that they really restore, not only normal contact, but normal occlusal surfaces. In regard to the mesial and distal marginal ridges and the V-shaped sulci radiating across these ridges I would even recommend going farther than nature, making the inclined planes and the radiating sulci more pronounced than normal. We need never slavishly copy nature, because as has been pointed out, forms are apt to be aberrational; thus in Fig. 1, the distal marginal ridge and accompanying sulci, are better in the right upper first molar than in the left upper molar. Suppose then that the right upper molar had lost this portion by caries. In making a restoration, should we copy the similar sound tooth on the opposite side we would not be producing a form even so good as it was in the original tooth.

Consequently, once we comprehend the mechanics of mastication, and the meaning and purpose of cusps, sulcus and marginal ridge, in making an inlay we may accentuate ridges and sulci as a means of increased protection.

At a lecture on this subject once, I made a similar statement and one gentleman asked me if I really thought that I could improve upon the handiwork of God. Without any irreverence I replied; "No! But I never have seen a gold inlay made by the Creator; and I am not at all sure but that He would accentuate those ridges and sulci if repairing a tooth in this manner."

It must be remembered that practically all teeth are something less than typically perfect; that the decayed tooth has already been proven to lack the element of self protection against onsets of caries. Hence I deem it admissible to deepen and widen our sluiceways, and to lengthen and sharpen cusps, if in this manner a better masticating unit may be pro-

duced, with a filling so formed that it will act to the utmost limit of form in producing self-cleansing surfaces.

As an example of works of this character, which however is not presented as the highest possibility of the art of inlaying teeth, but merely to show what can be done by myself, who cannot lay claim to any sculptural ability, I present two illustrations. The first (Fig. 5) is from a photograph of plaster casts taken from a mouth in which I made the attempt to restore masticatory function by replacing flat amalgam fillings with carved gold inlays. The white plaster of course does not show the outlines of the inlays but it has been found by experimentation that photographs from the white casts better depict the occlusal surfaces than can be done with casts colored to indicate the extent of the inlays. Fig. 6 is made from the same casts after the inlays have been painted in with water color. In this illustration the extent of the work is disclosed but much of the carving is obliterated because of the obstacles set up by the color to accurate reproduction by photographic process.

Very much more could be said on this subject, and very much more must be said; as for example we might discuss the methods of producing such inlay restorations and especially methods of properly forming the contactual areas, but this paper has already exceeded the limits set by the Congress rules.

System Versus Empirical Methods in Operative Procedure.

By Fred E. Hart, D.D.S., San Francisco, Calif.

On a previous occasion in contributing a paper of a similar character I referred to a quotation from one of Napoleon's letters to his brother which dealt with the value of organization and system in managing armies.

I again take the liberty of presenting it because I feel that it contains valuable thoughts which we may apply to our operative endeavors. The quotation is as follows: "For everything you must have a plan; whatever is not profoundly considered in detail produces no good results, I trust nothing to chance. There is a great difference between operations with a well-considered system from an organized center, and operations proceeding at haphazard without such a center. You will not be successful without system nor without bestowing the greatest attention upon it."

Reference to the establishment of a system may appear as dealing too much with fundamentals to be presented on this occasion, yet it seems true that comparatively few dentists follow a definite system in operative procedure, and, the consideration of it in that phase of our work may be justified.

A complete system for any undertaking can only be evolved by a thorough knowledge of the conditions to be met, the material with which to work, and the ultimate requirements demanded of the resulting product.

Dr. G. V. Black, through his great sense of observation, together with his personal achievements in both research and practice has given us a complete system which if followed unifies our technic and will give what is now generally accepted as an efficient result.

Dr. Black evidently believed as in the quotation: "that for everything there must be a plan; that whatever is not profoundly considered in detail produces no good result."

As a foundation for his system in operative procedure we may first take into consideration the work he has done in dental anatomy. It

includes a most comprehensive survey of tooth forms and measurements. No better system of nomenclature has been produced, giving as it does every surface and angle in terms, which, though anatomical in character, are so descriptive that they cannot be misunderstood. The fact that this system of nomenclature has been adopted by the *American Institute of Dental Teachers* is a further endorsement for the value of system.

His observations along histological lines added to the foundation, upon which is based his system of cavity preparation for the reception of filling materials.

One of the problems involved in the establishment of this system has been dental pathology. Dental caries, its causes, effects and limitations; diseases of the gingiva, peridental membrane, etc., have been carefully studied, and their connection with the filling operation considered. We observe that the superstructure of the Black system of cavity preparation is, in part, built upon a knowledge of dental anatomy and histology, with tooth nomenclature, which suggests the naming of the instruments and their application, to best perform the work, as necessary adjuncts.

The subdividing of the two groups of cavities, the pit and fissure, and smooth surface cavities, into the five classes which require a similar treatment, makes possible the systematic use of instruments best adapted for the work in each class.

Black's Method of Cavity Preparation.

It is scarcely necessary to mention cavity nomenclature, yet we often find dentists who have difficulty in describing a given cavity or surface due to their unfamiliarity with modern dental nomenclature.

Instrumentation has received its share of systematizing both as to names, formula, and manner of use. There seems to be considerable aversion to the Black set of cutting instruments. To the untrained, the impression is at once gained that it is a complicated set of instruments with a more complicated system of naming.

It is, however, very simple, and since he has definitely outlined the use of each instrument in his work on *"Technical Procedure of Filling Teeth"* an understanding of them is absolutely necessary to gain the benefits of his advanced teaching in preparing cavities to receive fillings. Pursuing this systematic plan in the preparation of cavities, we are directed by the requirements of the case at hand into seven different orders of procedure, obtaining the required outline form, retentive and resistance form, etc., which eliminates all question of doubt as to procedure and result expected.

Chair positions, finger positions, grasps for rubber dam applications, etc., have been systematized. So necessary did he consider the use of the rubber dam, that he called attention to its importance in his recent book on *Dental Pathology* and refers to the system devised to assist the operator in its adjustment.

Even his method of placing gold foil in the cavity, and its subsequent condensation has been the result of careful study and the adoption of a definite system; likewise the use of trimmers, knives and other finishing appliances are described in detail.

So complete and thorough is this system that every phase of the problem from the first view of the condition presented to the final completion of the operation, every instrument used and every movement of the operator can be intelligently directed in the minutest detail without confusion.

Empiricism in Dentistry.

To discuss the alternative in this paper we must leave the subject of system and, therefore, we are immediately confronted with the question of empiricism. Empiricism is defined in medical practice as "being by experiment or without science, operating in a large sense on mere individual experience," and operative procedures which are followed without system appeal to me as being empirical in every sense of the word. We have no definite comprehensive plan of study and no uniformity in procedure.

Discussing again the question of dental anatomy, the comparative number of dentists who could give a correct description of the teeth, the surfaces of which we are every day attempting to reproduce, shows a surprising neglect of this fundamental study. The following of the Black system would stimulate a more thorough study, because the understanding of the terms used is a necessary part of the system.

Instruments.

With regard to instrumentation my attention has been called to the several sets of instruments which are a modification, or substitution in part, of the Black set and do not conform to other phases of this system.

The use of these instruments is being advocated by men who are professedly following the Black system.

There is no denying that they can and do produce beautiful operations with their instruments, finding them adaptable in their own hands and they probably can instruct others to become as proficient in their use, but they have no text and they cannot personally instruct all who buy them; consequently there is confusion of thought and a disregard for system.

If a dentist has and knows Dr. Black's set of forty-eight instruments and has the text which describes their form and purpose, he can at any time refer to the text, applying what he reads to the instruments he has in hand.

Does it not seem that the benefits attending the adoption of a system, to make any instrument, or set of instruments, effective should demand complete instruction for their position and manner of handling; and since it is not possible to personally instruct all who purchase such instruments, is it not incumbent upon those who promote them that the purchaser be supplied with a text which will assist in gratifying the desire which stimulates the purchase?

In operative procedure many seem to think that the individual should be capable of developing a system for himself, and it is true that operators have become extraordinarily skillful through their own efforts, but they have required years to develop what system they have, and they are often unable to impart it to others should they desire to do so, because of no definite order of describing instruments used or procedure followed, and as these empirical methods are seldom the product of scientific reasoning they are consequently overdeveloped in some respects, and underdeveloped in others. An example of the effects of empirical methods is the excessive use of the round bur.

Use of Round Burs Condemned.

The resistance and retention demands of a cavity consists of making flat horizontal walls and sharp well-defined angles with surrounding perpendicular walls. A round bur cannot give such a result, and is, therefore, of little value in shaping a cavity, yet we find that there are nearly twice as many used as there are of the inverted cone variety, which type is indicated for the bulk of cutting within the cavity.

For data regarding this, I have made inquiry of some of the largest manufacturers of burs and the reports gathered show that the round burs sold, equal in number all the flat end varieties which includes the flat end fissure burs.

One of the largest manufacturers gave as a comparison of round and inverted cone burs: round, for straight hand piece, 64½ per cent., and inverted cone burs, 35½ per cent., for the right angle the round bur was not so popular, being 55⅓ per cent. for round, to 44⅔ per cent. inverted cone. If the round bur is used, only for the work to which it is best adapted, its production would be reduced to about one-tenth of the present output.

Empirical methods of procedure oftentimes result in great loss of time, increased discomfort to the patient, and a variable degree of efficiency.

The adoption of the Black system in so many of the dental schools, and the organization of professional men into study clubs for the purpose of acquiring and disseminating this knowledge presents a most favorable outlook for a general adoption of the system, yet it does seem that these institutions do not all favor the adoption of the instruments as recommended by Dr. Black, and as before stated, much is lost by the inability to correlate the instruction in the text with the instruments individually selected.

The student who sees the advantages of the Black system and wishes to produce operations worthy of the name, should have well in mind at all times, the pathology, not only of dental caries which he hopes to check, but of all surrounding tissues; the diseases of the peridental membrane, alveolar process, gingiva, etc., all of which may be influenced for good or bad by the completeness of the finished operation.

The value of a well-formed contact and the correction of all conditions which influence the health of the surrounding tissues must at all times be given the greatest consideration.

In conclusion I again repeat from the quotation before given: "Trust nothing to chance. There is a great difference between operations with a well-considered system from an organized center, and operations proceeding at haphazard without such a center."

Is it not so that efficiency in dentistry demands well-devised plans, profound consideration of details, the elimination of chance, and a definite system to direct our efforts?

And can we not say that this system, which has been developed by the man who stood on the highest pinnacle of dental fame, a great investigator, inventor, and author, capable of applying the product of his investigations and observations to practice in the most skillful manner is "A well considered system from an organized center?"

Those Having Pyorrhea Alveolaris Can be Cured but None of Our Patients Should Have This Disease.

By Robin Adair, M.D., D.D.S., Atlanta, Ga.

The sum and substance of the paper which I am about to read has been heard and practiced by many of you for some time, but my endeavor shall be to present this matter in terms so terse, that the same old story will prove interesting to all of you.

Classification of Diseases of the Mouth.

The question of the classification of the various diseases of the mouth has been given most careful consideration by your essayist, both in his office practice and in his teaching of the subject in the dental college. It seems absolutely necessary to reach some classification, but up to the present time he has not been able to accept any classification yet offered to the profession. The suggestion is presented to you of the great strides we could make in this direction, if those having these cases under treatment would secure photographs of the different classes of cases as they are presented. Then by getting these different cases together and fitting the description thereto, we might come to some definite understanding.

It is rather a reflection on our profession at the present time that the only good photographs of pyorrhea conditions published, are those issued by advertising concerns. I know of nothing that we need so much as we do a collection of photographs by each man showing exactly what he means by the classification which he uses.

To the essayist, all pyorrhea conditions are the same except in degree. When I was a student in medical college, I well remember an incident when our professor of operative surgery was performing an amputation of the breast. As you know, this is a very bloody operation, and some arterioles were squirting blood in every direction and had covered Dr. Hunter's eye glasses. He was making various stabs with his hemostatic forceps to catch the bleeding vessels, when some student, very much interested in the operation, leaned forward and asked, "Doctor, what is the name of that artery?" "It don't matter a d——— what the

name of it is, we have got to tie it just the same," he replied. I learned more of the principles of surgery from this remark than I could have from a dozen lectures.

Dr. Riggs' Treatment.

We learn from the early history of American dentistry that there was a dentist in Hartford, Conn., by the name of Riggs, who was reputed to cure pyorrhea alveolaris. His successes were so great that many now call this condition "Riggs' Disease." The crude instruments which he used resembled plows in shape. With no special knowledge of anatomical conditions, or bacteriological phenomena, such as we have to-day, he treated this disease with a larger degree of success than had therefore been known.

Dr. Fletcher's Method.

Another epoch in the development of the surgical treatment of this disease may best be illustrated by the work of the late Dr. Henry M. Fletcher, who gave most of his attention to curettage of the alveolus, claiming that this structure should receive most attention in the treatment of this disease. The essayist wishes to give all honor to this great dentist who did successful work, and whose writings to-day are among the best that have been recorded.

The Younger Method.

The third epoch in the development of the surgical treatment of pyorrhea may be called the "Younger School." These dentists were the first to give attention to roots of the teeth as the causative factor in this disease. In addition to the operation, this school injected warm lactic acid into the pockets, thinking by some means that it would dissolve any substance left by the scalers. We know the followers of the "Younger School" were very successful in their work, but it is very evident that their success was due to the scaling which they did rather than to the drug injected into the pocket.

Present Methods.

We are to-day entering upon the present epoch for the development of a systematized technique for handling pyorrhea cases. The dentist of to-day has in his hands perfect instruments with which to operate. He has a full knowledge of all anatomical and histological structures involved, as well as entire knowledge of the bacteriological flora of the mouth, and the systemic disturbances associated with this disease. With all of this knowledge at hand we take from each of the experts in former schools, who were rather one-sided in their opinions, yet were able to produce results; results, moreover, comparable with what we accomplish to-day.

In looking over the history of dentistry we find some of those who made a success in the treatment of pyorrhea; we see this class was successful by curettage of the alveolus, while others seemed to be just as successful in giving their attention to the peridental membrane. One fact however, that they all agreed on was that the *surgical work* was of prime importance, and just in proportion as the operator was a skilled dental surgeon, was his degree of success. While those who have treated pyorrhea by the medical means, have written various statistics in the reports of cases, we have not been able to see these patients. Those using surgical means as the greatest part of their work have always been willing and anxious to demonstrate to us in their office and in our society meetings the results of their treatment. We know that they cured pyorrhea.

While speaking of the surgical operation, your essayist wishes to condemn in no uncertain terms the *traumatism* which some operators produce by repeated prods into pyorrheal pockets and the constant scaling of the sensitive necks of the teeth.

We are not always able to prevent the traumatism; but by having clean, sharp and delicate instruments with which to do this operation, and then letting the pocket alone for Nature to finish the work, we can accomplish our purpose with a greater degree of success and less pain to the patient.

If later on, Nature fails to respond or the work fails on account of our not having done thorough instrumentation, then the operator is justified in again going into the pockets.

Post-Operative Treatment.

Another class of men who have reported various degrees of success in the treatment of pyorrhea alveolaris have minimized the importance of surgical work, giving the emphasis to the dressing. They have all said, "scale the teeth," and then dress with such and such an application, and use such and such a drug or mouth wash as if that were of more importance.

When a surgeon performs an operation, he dresses the wound, and the dressing is important, yet, whatever success he attains, is attributed to the surgical work. Successful operators for pyorrheal condition have various post-operative dressings or treatments, but they attribute their results to surgical intervention rather than to this treatment.

Vaccine Therapy.

We read not so long ago about the millions of bacteria which we had to inject into the patient in order to cure pyorrhea. Many of us, when we contemplated this as the way to cure pyorrhea, would have given up if this awful technique were the only treatment for the disease. The human economy has endured a lot of mistakes at our

hands in the introduction of vaccination for the cure of pyorrhea alveolaris. The discussion of this subject at the Rochester Dental Meeting would certainly deter us from a general adoption of this treatment, inasmuch as it was characterized as the greatest failure ever introduced into the dental profession.

Emetin.

The latest enthusiasts almost stunned us by their report of successful cure. Their successful pyorrhea treatments which we have all heard much of, were made with emetin and injections of mercuric succinimide.

Now all of these treatments and discoveries are of some importance, but the mistake these men make is in saying in an offhand manner that the "teeth should be cleaned," as if the surgical work were the least factor in the cure. One of the greatest elements in the failure of treatment for pyorrhea is that dentists have read this and that announcement of some great cure and have followed this one school to the exclusion of all others. We should be broadminded and take the good points from every one of the various claimants to obtain success in the treatment of pyorrhea alveolaris. We must bear in mind that personal equation counts for a good deal and that probably other men, by other methods, in other parts of the country are making a success of the treatment of this disease.

Is Pyorrhea Incurable?

It is not uncommon to hear dentists say that pyorrhea is incurable, men who are, undoubtedly skilful operators and well up in the profession. Now if pyorrhea alveolaris can be cured, what is it that often causes failure? My answer to this is the object of this paper, which I wish to impress upon your minds. Here is a man who has treated a case of pyorrhea by a successful method. He knows that he has excellent results. Then in a few months' time the patient may return with a condition similar to that before treatment, and then by an illogical conclusion the dentist says that it is "systemic" and that, "pyorrhea cannot be cured."

Prevention of Pyorrhea.

Your essayist has practiced dentistry but fifteen years, but due to the fact that in the beginning he fell heir to a good-sized established business from his father who had practiced about forty-five years, he can safely say that his experience is based upon a much greater observation than actual practice. The point I want to make is that my father was always interested in the subject of oral hygiene, and our old records show that it was a rare thing for a regular patient of his to present a case of pyorrhea. Certain it is that in my own practice, I would think myself blameworthy if one of my regular patients were to develop a case

of pyorrhea alveolaris. The secret of this is in the mere fact that we always impress upon our patients the importance to themselves of thorough technique in oral hygiene and home treatment. Other practitioners interested in this work have told me that the same has been their experience.

In this connection, it is well that I touch upon a delicate matter in regard to the patient. It is a strange fact that whenever a new patient presents a case of pyorrhea alveolaris, he tries to impress upon you the fact that he has always "carried out oral hygiene rules carefully, sometimes brushing his teeth five or six times a day." He is honest in this contention, just as honest as the patient who breaks his artificial teeth drinking water, or breathing plain air.

A surgeon would not think of performing an operation unless he had first cleaned up the field and had placed the patient in a position to stand the operation. So it should be with a dentist. I think it is the duty of every dentist to refuse to place any restorative work in the mouths of his patients unless they are willing to have their mouths put in a fairly clean and healthy condition. Though the patient may go elsewhere to have this immediate work done, it will only be a short time before he will realize your honesty, and return to you. Then he is your patient to command as to operation and fees.

I do not know how it is with you, but the first question a patient asks down South is, "Do you guarantee a cure?" Charlatans in dentistry and medicine have a habit of "guaranteeing" a cure in advance, and while the patients seem to differentiate between the charlatan and the real practitioner, still they cling to this trait of quackery. As we are not in the insurance business, we tell them that the Lord did not make their teeth with any guarantee against pyorrhea, and neither can we guarantee against it. However, if they are inclined to be reasonable in their expectations and are willing to do their part, then I tell them a cure can be expected.

Fees for Pyorrhea Treatment.

Another point which prevents success in the treatment of pyorrhea alveolaris, and one which I have never been quite able to understand, is the inability of the dentist to secure proper remuneration for pyorrhea treatment. If it were possible for every dentist in this audience to make as much money by the treatment of pyorrhea as by ordinary practice, he would treat every case of pyorrhea that came under his observation.

I have found it well in practice to tell the patients that the treatment will cost them such and such an amount and that part of the money will be expected in advance as a retaining fee. If you have never tried this

method, you do not know the satisfaction that comes from so doing. If the patient is one to whom I know it makes no difference about the cost, I simply step to my desk, write out my estimate of the work, and put it in an envelope together with his engagement card and hand it to him. If he is not satisfied, he will then call me up and break his engagement. Thus there is a perfect understanding between dentist and patient, and this prevents unpleasant discussion. There are many little incidents in the office practice like this which enter into the successful treatment of pyorrhea alveolaris.

Concluding this part of the paper, I want to repeat that any case that is curable at all will be benefited by your earnest efforts following any standard method of treatment, and it is our duty to become efficient in the management of these cases and after a cure has been effected, let us bear in mind that the greatest and best part of our work lies in the lessons which we give our patients for the future preservation of the health of their mouths.

Pyorrhea Should not Exist.

In all of our cities we find that specialists on pyorrhea are multiplying on every hand. They are undoubtedly doing good work, but this stands as an indictment against our profession that this work is not being done in every general office.

We, as a profession, are not doing our duty toward stamping out pyorrhea alveolaris, and the only way to accomplish this is to make prophylaxis treatments, routine procedures for our patients and in this manner train them in the proper care of their teeth. I know that we, as dentists, claim that we are "cleaning teeth" all the time. We tell our patients to brush their teeth and that is about all the instructions they receive. I know that the profession is delivering lectures before Mothers' Clubs and schools, but gentlemen, in my opinion, this is not the most important place to carry on this training. Suppose your record of office operations should be examined. Take for instance, the last ten patients for whom you worked. This one had a crown, this one a filling, this one a bridge, and so on; in the ten operations, probably two had had their teeth cleaned. If you had been interested in this subject of prophylaxis, probably nine of these patients would have received a prophylaxis treatment before they were dismissed, and, if charged rightly, these items would add up on the ledger the same as other dental operations.

We can argue all we want to, but until the dental profession recognizes prevention of pyorrhea alveolaris to be of as much importance as the cure, we are not living up to our opportunities.

The methods of how to prevent pyorrhea alveolaris in your prac-

tice are many and varied. The general practitioner may do it himself, and as his work increases an assistant can be put in.

The Dental Hygienist.

I think that the great solution of this problem is the introduction of women into our officers to take up this part of the practice. Women are peculiarly adapted to nursing; man is a failure as a nurse; and prophylaxis for the prevention of caries and pyorrhea alveolaris may best be taught by women. I want to say further that a dental college education seems to unfit men for this class of work, just as it unfits a woman who aims to be a nurse to have a medical college education. If a trained nurse knows the various instruments and how to use them, she is tempted to do minor operations. The same thing applies to the dental nurse, or dental hygienist. A knowledge of the instruments used for cleaning and the knowledge of how to clean the teeth and around the free margin is all that she should know. Women are doing this work successfully in some sections, and I think she should be encouraged in this effort until there is some other solution of the problem. Any dentist can train a capable girl in six months to do efficient work.

In teaching this preventive work in the dental colleges the attention of the student is held until it comes to the very simple technique, then his interest seems to flag. It seems too easy to be true. We stand enthralled before a picture painted by some great artist, but if we had visited him in his small studio, and had seen the canvas and mass of paints, we would not have seen anything in the studio that seemed beautiful. With the paints and brushes the artist produces the wonderful results, and with the wood points and floss silk, the dental assistant can produce a healthy mouth, hard gums and polished enamel, the most beautiful picture in Nature and a positive prevention of pyorrhea alveolaris.

Pyorrhea alveolaris can be cured, but none of our patients need have it. "To cure is the voice of the past, to prevent is the Divine whisper of the future."

The Successful Scientific Treatment of Periodontal Disease (Pyorrhea Alveolaris.)

By T. Sydney Smith, D.D.S., San Francisco, Cal.

The object of this paper is to consider such phases of the subject of periodontal diseases (pyorrhea alveolaris) as the relation which they bear to systemic diseases, the proper treatment of them, and finally, to establish the conclusion that they may be rapidly and permanently cured. This conclusion is based upon the results of my own investigation and practice, and will be verified by reports of typical cases taken from my records.

I have already published brief summaries dealing with some of the problems to be considered at this time. I wish now to correlate these, emphasize the most important of them, and add the results of later work. Let us first consider the relation which exists between systemic diseases and periodontal infections.

Systemic Influences and Effects.

Almost all who have given periodontal diseases careful study believe them to be the result of pathogenic microbic infection. They also believe that either local traumatic conditions, or general metabolic disturbances, are necessary prerequisites of these infections. The relative importance of these contributing factors, however, is still a subject of controversy.

It is generally recognized that certain systemic conditions lower the resistance of the body to invading pathogenic micro-organisms, and also that metabolic disturbances may increase the precipitation of salivary calculus on the teeth. I have found, however, that these systemic conditions do not exert more than a slight contributory influence on periodontal diseases and that they are of minor importance when compared with either the infecting organisms or the local traumatism which provides these with the path of entry. On the other hand, the dangers which arise from these periodontal septic foci are not sufficiently recognized at the present time. Recent investigations show that many of the most serious diseases occurring throughout the body are caused by patho-

genic micro-organisms which are carried by the blood stream from septic foci at some other point.

Billings (1) has shown that these organisms are carried by the blood and form embolic bacterial masses in the terminal arteries. This causes a proliferation of the endothelium at the site of the embolus thus closing the lumen of the vessel. In this way the blood supply to the various organs and tissues throughout the body is interfered with and pathological processes are permitted to develop.

Rosenow (2) has found that certain pathogenic organisms possess facultative cultural properties and also a variable pathogenic specificity, the streptococcus-pneumococcus group alone being capable of producing a wide range of systemic diseases. By animal passage and cultural environments he has demonstrated that transmutation of this group readily occurs. In this way he has been able to change pneumococcus into streptococcus-mucosus, S-rheumaticus, S-viridans, and S-hemolyticus. When such transmutation occurs the change is complete. All known tests show the resulting organisms to be typical of the strain they have acquired. They also produce the pathogenic effects which are characteristic of these strains. Conditions which bring about transmutation appear to be such as symbiosis, variations in oxygen tension, salt concentration and incavation. Periodontal septic foci therefore furnish exceptionally good conditions for the transmutation of these organisms; and there is no spot in the body where they can more readily gain access to the blood stream. From studies made up to the present time, we are led to believe that some of the most serious systemic diseases may result from these periodontal septic foci.

Necessity of Proper Treatment.

The dangers which arise from periodontal septic foci make it imperative that we prevent their development and cure them if they have already occurred. They are not cured, however, until the pyorrheal pockets are entirely obliterated. To accomplish this we must either extract the affected teeth, remove the separated supporting structures to the level of the floor of the pockets, or secure a vital reattachment of these tissues to the cementum.

Reattachment of Tissues to Cementum Believed Impossible.

Many leading investigators believe that this reattachment cannot take place. A. Hopewell Smith (3) has written: "The hopelessness of retaining the teeth and of building up bone which has been lost by absorption or the recalcification of decalcified foundations must be apparent.....The treatment, at best, can only be palliative, and, unfortunately, only directed to the prevention of further

destruction, and not the rehabilitation or reconstruction of parts absolutely forever destroyed, and not admitting of the adoption of certain plastic measures which obtain, at times, in connection with other bones of the body."

G. V. Black (4) concurred in this opinion by saying: "When detachment has occurred, such amelioration of conditions as will prevent the detachment going further, and such healing as will give comfort and a fair degree of usefulness to the organs involved, is probably the best we will ever be able to do. This statement seems to be justified by studies made up to this date. What the future may bring cannot be predicted."

Eugene S. Talbot (5) after thirty-five years of research along these lines, recently summed up the results of his work by saying: "This treatment will improve the health of the tissues, but will not completely cure the disease."

Reattachment Possible.

I take issue with these writers for I have found that the separated tissues will form a vital reattachment to the cementum of living teeth and completely and permanently obliterate the pyorrheal pockets. The healing is usually of a rapid or primary character which prevents any further recession of the gums. These new results, then, make it necessary that we study the tissues more carefully, and also consider the various methods which have been employed in the treatment in order that we may learn to assist Nature in the best possible way.

A Study of the Tissues.

The Cementum.

Many writers have stated from time to time that the portion of cementum which becomes involved in pyorrheal pockets soon dies. In 1904, D. D. Smith (6) wrote: "Serumal deposits destroy the life of the cementum and pericementum." Again in 1911, G. V. Black (7) stated: "In case of the separation of the membranous covering from the cementum, the continuance of its vitality must be brief." Even as recently as February, 1915, the editor (8) of *The Journal of the American Medical Association* wrote: "When the peridental membrane is stripped from the cementum by suppuration, the cementum becomes a dead tissue which cannot be exfoliated, except in its entirety by the removal of the tooth."

These statements are based on the assumption that by this separation the cementum is deprived of nutrition and must therefore die. This becomes, then, an extremely important question, for if it were true that the portion of cementum which is involved in pyorrheal pockets were dead, as the result of the separation of the pericementum, we could make

no intelligent attempt to secure a reattachment of the surrounding tissues to it, because living and dead tissues cannot unite. The fact is, however, that the above assumption *is not correct*. The cementum may receive nutrition from either the pericementum or the pulp and does not die in these cases so long as the pulp remains vital. Although the cementum and dentine are formed in opposite directions from the periphery of the latter, and apparently receive most of their normal nutrition from different sources, once they are formed, they make an unbroken structure. While microscopic examination reveals a very different arrangement of the structures in dentine and cementum, it also reveals a possible path for the passage of nutrition in either direction from one to the other. The dentinal fibres which radiate from the pulp have direct communication with the protoplasm in the granular layer, which in turn is connected at many points with the canuliculi of the cemental lacunæ. Fig. 1 shows this arrangement of the structures very clearly.

In this particular case the outer lamella is the only dense structureless portion. It must be admitted that if nutrition can pass inward through this dense portion to the deeper lamella from the pericementum, it is far easier for it to pass outward to this portion from the pulp. The fact that nutrition may pass in this direction was demonstrated by Theo. Von Beust (9). While studying the source of continued metabolism in enamel he found that a staining fluid would pass into the enamel and cementum from the pulp chamber. He says: "A section made from such a tooth shows the enamel canals stained, and in addition, discloses the interesting fact that canals communicate through the dentine and cementum between the pulp and the peridental membrane.....The intimate relationship existing between the pulp and the cementum is thus clearly demonstrated."

Proof that nutrition may pass to the dentine from the pericementum was furnished in a case reported by Joseph Head (10). He found hypersensitive dentine in teeth from which he had removed all traces of the pulps. Describing one of these teeth he writes: "The pulp was removed from a molar May 22, 1897, and for over one year and a half the dentine remained sensitive and presumably alive." In this case the nutrition which reached the dentine must have passed through the cementum from the pericementum, for there was no other possible source.

The fact that the separated tissues quickly unite to the cementum of vital teeth when assisted by proper surgery, but simply granulate and tighten around pulpless roots, proves conclusively, if we have no other evidence, that cementum receives nutrition from the pulp as illustrated by Fig. 1.

Fig. 1. Photomicrograph of a section of human cementum from the root of a cuspid tooth of patient over 65 years of age, showing free communication between the pulp and the cemental lacunæ via the dentinal tubules and granular layer; also a very dense outer lamella of cementum through which nutriment is believed to pass inward to the deeper lamellæ from the pericementum. Specimen prepared and owned by Dr. J. S. Engs, of Oakland, California.

The Pulp as a Source of Nourishment.

Sufficient value has not been placed on pulps. Some investigators have endeavored to show that the pulps are no longer necessary to the teeth after the dentine is formed and that we should remove a large percentage of them. It has even been stated that their removal is beneficial in the treatment of periodontal diseases, as the blood which supplies the pulp is deflected to the pericementum. The fact is this small amount of blood could not add appreciably to the abundant supply of the pericementum, but the removal of this nutrition from the other tissues damages them permanently. When portions of cementum have been deprived of nutrition from their pericemental source by the formation of pyorrheal pockets, it is irrational to remove the only other source from which they could receive nutrition by the wanton destruction of the pulp. Its removal stops any further calcification in either the enamel or such surfaces of dentine as have been exposed by abrasion or erosion. In addition to this serious damage to the tooth, the removal of the pulp usually results in establishing a dangerous apical septic focus.

The Pericementum as Related to Periodontal Diseases.

Since the structure commonly called the peridental membrane is neither a true ligament nor a membrane, and as it surrounds the cementum and is attached to it, I shall speak of it as the pericementum. We must bear in mind that this pericementum is a structure whose fibres penetrate the cementum on the one side and in part penetrates the inner surface of the alveolar process on the other, and that it does not terminate at the margin of this process where it joins the periosteum covering the outer surface; neither does it terminate at the point where its fibres cease to penetrate the gingival margin of the cementum, but it continues beyond these points into the gingivæ. Therefore the weakest point in the pericementum is at the attachment of its fibres to the cementum, and a cleavage of these two structures could easily occur at this point.

A careful study of pyorrheal lesions shows that this cleavage does take place. Although this causes atrophic changes to occur in the detached pericementum, and at times portions of it may be destroyed, this does not mean the complete destruction of all the detached portion as many have stated. This conclusion is established by my own cases of perfect reattachment.

The Alveolar Process.

The absorption which occurs in the alveolar process, and the infection which frequently penetrates the surrounding osseous structures when periodontal diseases are present, do not constitute an

osteomyelitis as Medallia (11) has claimed, but is simply the result of the pericemental infection which begins in the gingival sulcus. This is proven by the fact that when the soft tissues have been reunited to the cementum all destruction of bone immediately ceases and reconstruction begins. Even when a rupture of the pericementum leaves an exposed margin of bone in the bottom of the pocket it does not form a true sequestrum, but merely presents a carious condition on the surface.

The Blood. The blood plays an extremely important part in the treatment of periodontal diseases, as will be shown later. Its cleansing, bactericidal and reconstructive properties make it necessary that we should carefully avoid destroying it. I (12) called attention to this in a paper published in the *Pacific Coast Gazette,* Nov., 1909.

Serumal Deposits. When the pericementum becomes detached from the cementum the calcium salts which are held in solution in the blood escape from the broken vessels and precipitate on the surface of the cementum. These deposits may form coarse, irregular nodules, but more frequently they are so hard, and so thoroughly embedded into the pitted surface of the cementum where the fibres had been attached, that it is difficult to detect and remove the last trace of them.

Conditions Prerequisite to a Cure.

It has already been stated that periodontal diseases are not cured unless the pyorrheal pockets are entirely obliterated, and that this result can be secured in the case of vital teeth by inducing the separated tissues to form a reunion with the cementum. I have found that when conditions are right this reunion takes place with the same rapidity and regularity that occurs in the healing of other wounds. Old age and the systemic diseases which were formerly believed to be the cause of periodontal lesions do not interfere with healing here more than in other parts of the body.

Figs. 2, 3 and 4 show that much new bone may be expected to form in these cases, and also show the difference in healing *in the case of living and of pulpless teeth.* The thin portion of bone surrounding the vital lateral incisor at the margin of the newly formed process as seen in Figs. 3 and 4 proves that the soft tissues have formed a vital reattachment to the incisor, while the vacancy around the pulpless cuspid at the corresponding point shows that the tissues have merely tightened around it. This no doubt interfered with the development of the bone

around the incisor. The arrangement of the tissues around the lateral incisor as shown in Fig. 4 combined with the natural appearance which they present when carefully examined in the mouth leave but little doubt that a perfectly normal pericementum has formed between the new alveolar process and the cementum. The union in these cases is certainly not an ankylosis.

To secure these results it is necessary to comply with the laws which

Fig. 2. Fig. 3. Fig. 4.

Fig. 2. Radiograph taken April 27th, 1914, showing the destruction of bone resulting from an advanced pyorrheal condition. This case was selected to show the difference in healing around a vital and a pulpless tooth.

Fig. 3. Radiograph of same case taken August 15th, 1914, showing the rebuilding of bone resulting from the vital reattachment of the separated pericementum to the cementum of the vital lateral incisor.

Fig. 4. Radiograph taken December 7th, 1914, showing complete calcification of the newly formed bone seen in Fig. No. 3, also what appears to be a perfect pericementum between the new bone and the lateral incisor.

Case treated by Dr. Frank C. Pague, San Francisco, California. Radiographs taken by Franklin W. McCormack, San Francisco, California.

govern healing. It must be remembered that this reunion is a biological process. Hence, first, it is absolutely necessary to have freshly exposed living cells on all of the surfaces which are to take part in it. Second, it is equally important that none of these freshly exposed cells, including those of the blood, be impaired by the introduction of foreign agents into the wound. Third, these surfaces must remain in undisturbed contact for sufficient time to permit the union to take place. From this it can be seen that it would not be sufficient to destroy the amœbic and bacterial life in these pockets, if such were possible, or even to add to this the removal of all of the calculus by employing a tartar solvent. Such treatment could not provide the necessary freshened surfaces, and the agents thus employed would destroy many of the cells on which we must depend for repair.

Treatment of Cementum.

In preparing the surface of the cementum the surgeon should thoroughly remove all of the calculus with suitable instruments, and then scrape the involved portion just enough to remove the pitted surface which gave attachment to the pericemental fibres. This leaves a clean, freshened surface on the cementum which is filled with life if the pulp is vital. Great care should be exercised not to cut through this dense lamella into the deeper and more porous portions.

Treatment of the Soft Tissues.

Several writers have advised packing the separated soft tissues away from the roots before commencing to operate. Others have advised lacerating these tissues extensively. Some have even recommended the use of chemical agents to destroy the surface cells and provide unhealed tissues. All of these methods merely increase the difficulties of reuniting these tissues. The fact is that the inner surfaces of the separated soft tissues are usually in an unhealed, bleeding condition when we find them. Extreme care should be exercised not to aggravate this condition. Laceration or bruising adds to the difficulty of healing here just as it does in other wounds. These tissues must also be left as close as possible to the cementum that they may have a chance to unite with it.

Treatment of Bone.

Exposed carious margins of bone in the bottom of pyorrheal pockets must be carefully curetted, but extensive cutting should be avoided. Those who believe these diseases are chiefly within the bone have removed altogether too much of it. M. H. Fletcher (13) who held this opinion reported that he had even cut into the antrum in thirteen cases.

Cleansing of the Wounds.

It is necessary to remove the loosened particles of calculus from the wounds, in the surgical treatment of periodontal diseases, but perfect healing is dependent very largely upon the methods which are employed to accomplish this. Some have advised the use of acids to dissolve these particles as well as those which may not have been removed from the cementum. These acids should not be applied because they destroy the liberated blood and freshly exposed cells in the surrounding tissues and make rapid healing impossible.

The majority of writers recommend washing of the wounds to remove the loosened calculus. It has been advised that as much as a quart of normal salt solution should be used to syringe out a single pocket. This method of cleansing also should be discontinued. We should rely

entirely upon the assistance of the blood for cleansing these wounds. It coagulates when liberated, and in this way it incorporates the fine, loosened particles of calculus in the meshes of its fibrin. When they are thus enveloped in the coagulated blood they may be removed from the wounds by the instruments more thoroughly than by washing. This is especially true where correct surgical methods have been employed and the separated soft tissues remain close to the roots. When the tissues are prepared in this careful manner there is very little hemorrhage, but even this slight trace is sufficient for cleansing.

Sterilization of the Wounds.

The sterilization of these wounds is essential but this must be accomplished by the tissues. Although many of the pathogenic organisms are removed with the calculus, great numbers still remain in the tissues in spite of the most perfect surgical treatment that can be given. The majority of surgeons have endeavored to destroy these remaining organisms by introducing antiseptics and germicides into the wounds. Ionic medication has been restored to in these cases in order to drive the germicidal agents more deeply into the tissues and reach the organisms which have penetrated the structures. To kill these pathogenic organisms by artificial means it would be necessary either to boil them or bathe them in some medicinal agent equally destructive. Therefore all of the organisms cannot be destroyed in these wounds by the introduction of germicidal agents. These agents would, on the contrary, impair much of the tissue.

In treating these periodontal lesions we should bear in mind that they are in a state of chronic infection and that the pathogenic organisms have lived in them for some time in close contact with unhealed tissues and open blood vessels. This has forced the blood and fixed cells to fortify themselves with antibodies to meet the various organisms in any given case. These antibodies and the phagocytic cells hold the bacteria in check and account for the slow development of periodontal diseases. They also quickly destroy the remnant of organisms which are left in the wounds when we give the tissues proper surgical assistance. The rapid healing which follows the operation is proof of this. These antibodies possess a degree of specificity which could not be equaled by artificial germicides, and are the only bactericidal agents which can be tolerated by all of the tissues.

Endameba.

Attention has recently been called to the presence of endamebas in these lesions, but at the present time investigators are divided in their opinion regarding them. Some claim they are the cause of pyorrheal lesions, and

report that the appearance of the tissues is improved when the endamebas have been destroyed by the emetin treatment. They all admit, however, that this does not obliterate the pyorrheal pockets. Other investigators believe that endamebas feed on bacteria and that they may be beneficial, assisting in the sterilization of the wounds.

The results of my own work throw valuable light on this problem. During the past twelve years I have been able to secure a vital reattachment of the tissues to the cementum of living teeth and the healing has usually been of a very rapid character. These results have been secured by proper surgery without the aid of endamebacides. This proves conclusively that even if endamebas are eventually found to be the cause of pyorrheal pockets their presence in the wounds do not interfere with healing.

It is interesting to mention in this connection that the only case in which I have failed to secure rapid healing, around at least some of the teeth, was in the case of a young man in whose mouth the endamebas had been destroyed by the emetin treatment. In this case the tissues eventually united to the cementum by slow granulation, but only with repeated surgical aid.

The Organization of the Blood-Clot.

The value of the reconstructive properties of the blood in the treatment of periodontal diseases was recognized as early as 1885 by Briggs (14) of Boston, and Atkinson (15) of New York. They endeavored to assist the organization of the blood-clot by sponge-grafting. This method was never very generally practiced.

Recent efforts have been made to assist Nature in organizing the blood-clot by using sealing agents, the object being to bind the tissues to the cementum and keep out the saliva until the blood-clot has become organized. These sealing dressings should not be used because some of the ingredients they contain, especially if it be iodine, would destroy the liberated blood instead of protecting it. When correct surgical methods are employed the tissues are left so close to the roots that they do not require artificial support to hold them in physiological relation to the cementum. If they should, however, be separated enough to suggest the need of some artificial support the application of a sealing dressing would be very harmful because it would flow into this space and form a film which would hold the tissues apart. It is not necessary to keep the saliva away from the margin of the wounds for it does not interfere with the healing. Experience shows that wounds heal very rapidly in the mouth although they are bathed in saliva. It is so important to have the blood-clot become organized, and to have a rapid reunion of the

tissues take place after the surgical treatment, that we should endeavor, if possible, to bring this about. Therefore, when the tissues have been carefully prepared the last act should be to remove any fibrin that can be detected and then to produce a slight fresh hemorrhage in the bottom of the wound. This blood should not be disturbed because any further instrumentation would tend to defibrinate it and interfere with organization.

When Polishing Should be Done.

The thorough polishing of the crowns of the teeth and denuded portions of the roots is very important, but the success of the treatment depends largely upon the time when the polishing is done. A study of the tissues from a biological standpoint shows clearly that polishing agents should not be allowed to enter the wounds while the surgical operation is being performed, or at any time during the process of healing. Therefore, the crowns of the teeth should not be polished just before the surgical work on the roots is commenced, because some of the abrasive material used would enter the pockets and be much more difficult to remove from the wounds than the loosened calculus. Others have gone further and have so completely overlooked this necessary protection of the tissues as to deliberately introduce flour of pumice into the wounds while polishing immediately after the completion of the surgical treatment. Some have even repeated this at regular intervals for a considerable time, insisting that the pumice should be carried to the bottom of the wounds each time it is inserted.

What should be done is to thoroughly remove with suitable instruments all deposits from the crown and neck of each tooth just before the root is surgically prepared. No polishing beyond this should be attempted until the reunion of the tissues has occurred and the healing has advanced sufficiently to tolerate it.

Support of Loose Teeth.

It is important in the treatment of these diseases to give loose teeth some form of artificial support which will hold them in as near physiological rest as possible. This is necessary to allow the soft tissues to become reattached to the cementum and also to permit the rebuilding of bone. Since normal bone will absorb if unnatural pressure is brought to bear upon it we should not expect new bone to form if the teeth are left unsupported. All artificial supports whether of a temporary or permanent character must be constructed in such a way as not to necessitate the removal of any of the pulps. They should also provide for easy and thorough cleansing and avoid all irritation of the soft tissues.

Correction of Malocclusion.

Malocclusion should be corrected as far as possible in order to get the best results in the treatment of periodontal diseases, but extreme grinding of the cusps should be avoided. No definite rule can be laid down for this as each case presents new problems which must be left to the judgment of the periodontist.

Report of Cases.

Case I.

I will cite a case to show how rapidly periodontal diseases may be cured by proper surgery when the teeth are vital. Mr. H., age 38, presented for treatment December 1, 1913. There was an advanced, chronic pyorrheal condition around all of his teeth. The right upper cuspid had been lost from this cause. The gums had receded a great deal and the lesions measured from 5 to 12 m.m. in depth. He had been seeking a cure for years and had been treated by specialists in different parts of the country. All of them used a combination of surgery and medicinal treatment. The result was that the condition grew steadily worse. I commenced the surgical treatment of the tissues, Monday, December 1, 1913, and completed it the following Friday, December 5th. During these five days I spent 19 hours in the work. The tissues formed a vital reattachment to the cementum of all the vital teeth and the healing was so rapid that I was able to polish the crowns the following Thursday, December 11th. I did not see him again until February 4, 1915. At that time his gums were in perfect health with no trace of the pyorrheal pockets except around a few pulpless teeth in the lower arch. Even these were greatly improved.

Case II.

A second case will serve to show that even extremely loose teeth may be cured in many cases. Mrs. S., age 46, presented for treatment May, 1909. There was an advanced pyorrheal condition around all of her teeth. The upper left central incisor was so loose that she had to keep it tied in place with a thread. Although the pocket extended fully 12 m.m. beneath the gingival margin the pulp had remained vital. This tooth had also been treated many times by distinguished specialists who used the old medicinal methods along with surgery. I operated on it May 5, 1909, with the result that the tissues rapidly reunited to the cementum. The healing was so complete that four years later a prominent dentist endeavored to convince her that she had never had pyorrhea. He insisted that I had simply made her believe there was a pyorrheal pocket around

the incisor, stating that if there really had been one it would still be there because all of the tissues necessary to take part in the reunion would have been destroyed. He supported his arguments by quoting from the leading authorities on the subject.

Conclusions.

1. Periodontal diseases are not a local manifestation of systemic disturbances as formerly believed.

2. Periodontal septic foci are capable of producing a large number of systemic diseases, and are among the most dangerous foci to be found in the body.

3. Incorrect theories have been held regarding the various tissues involved in periodontal lesions, and wrong methods have been employed in their treatment.

4. These incorrect theories, and the failures resulting from wrong methods employed give rise to the belief that periodontal diseases are incurable.

5. Periodontal diseases can be rapidly and permanently cured. The separated tissues will form a vital reattachment to the roots of living teeth if proper surgical methods are employed to assist them.

6. Proper surgical treatment involves careful preparation of the tissues, undisturbed contact of the prepared surfaces, and freedom from irritation or injury by foreign agents.

Bibliography.

(1) Billings, Frank—"Focal Infections: Its Broader Application in the Etiology of General Disease." *The Journal of the American Medical Association,* Sept. 12, 1914, p. 899.

(2) Rosenow, E. C.—"Transmutation Within the Streptococcus-Pneumococcus Group." *The Journal of Infectious Diseases,* Jan., 1914, p. 1-32.

(3) Hopewell-Smith, A.—"Pyorrhea Alveolaris—Its Interpretation," *The Dental Cosmos,* Sept., 1911, p. 991.

(4) Black, G. V.—"Beginnings of Pyorrhea Alveolaris—Treatment for Prevention," *Items of Interest,* June, 1911, p. 426.

(5) Talbot, Eugene S.—"The Treatment of Interstitial Gingivitis and Pyorrhea Alveolaris," *The Dental Cosmos,* May, 1915, p. 490.

(6) Smith, D. D.—"Alveolar Pyorrhea—Its Cause, Sequelæ and Cure," *Transactions of California State Dental Association,* 1904, p. 48.

(7) Black, G. V.—"Beginnings of Pyorrhea Alveolaris. Treatment for Prevention," *Items of Interest,* June, 1911, p. 424.

(8) Editor, The Journal of A. M. A.—"Endamebas and Pus Pockets About the Teeth," *The Journal of the American Medical Association,* Feb. 13, 1915, p. 593.

(9) Von Beust, Theo.—"A Contribution to the Study of Immunity to Dental Caries," *Dental Cosmos,* June, 1912, p. 662.

(10) Head, Joseph—"Physiological Reasons for Supposing That Dentine and Enamel in Pulpless Teeth May Be Nourished," *Dental Cosmos,* Oct., 1899, p. 1037.

(11) Medalia, Leon S.—"Chronic Alveolar Osteomyelitis (Pyorrhea Alveolaris). Its Causes and Treatment with Vaccines," *Dental Cosmos,* Jan., 1913, p. 24.

(12) Smith, T. Sydney—"Permanent Control of the Alveolar and Gingival Diseases," *The Pacific Dental Gazette,* Nov., 1909, p. 728.

(13) Fletcher, M. H.—"Alveolitis, or Some Pathological Conditions Arising from Inefficient Care of the Mouth," *The Journal of the American Medical Association,* Dec. 19, 1908, p. 2117.

(14) Briggs, Edward C.—"Sponge Grafting," *The Journal of the American Medical Association,* Jan. 31, 1885, p. 120.

(15) Atkinson, W. H.—"Pyorrhea Alveolaris—Sponge Grafting as Related Thereto," *Transactions of American Dental Association,* 1885, p. 149.

Mental and Co-Operative Dentistry.

By C. Smith Long, D.D.S., Portland, Oregon.

Do you want the laity to know and appreciate the importance of proper dental service? Why has the prophylactic phase of dentistry developed so slowly? How does prophylaxis compare with repair? Who profits most? Are you willing to do all in your power to prevent oral disease?

1. Do you want the laity to know and appreciate the importance of proper dental service? By proper dental service I mean the best that dentistry knows, regardless of the time it takes to render that service.

Since the beginning the great majority of dentists have failed to make patients appreciate the true value of dentistry. There is a reason. What is it? It cannot be said to be the fault of the profession, even though it is a lack of the right kind of thinking. This very thing has happened to every trade and mechanical profession in the world. It has been easier to develop and perfect tangible rather than intangible things.

Consider the adding machine, the cash register, the computing scale, the protectograph, and hundreds of other wonderful patents. We have been passing through an inventive age, and dentistry has kept pace with the mechanical work in a very creditable manner, quite, however, at the expense of the preventive field. We have developed the mechanical, the operative or repair phase of dentistry, and have neglected the mental, the instructive, the prophylactic phase. We have neglected to learn and teach oral hygiene. We have neglected to teach cleanliness. We have neglected to teach prophylaxis. And when we have neglected these, we have neglected just that upon which all medicine, surgery and dentistry are based.

2. Why has the prophylactic phase of dentistry developed so slowly? Because dentistry has been on a mechanical basis, a contract or estimate basis, fees being charged for tangible things. Fillings, crowns, plates and all the time spent in showing, explaining and instructing positively lost as far as profit to the dental surgeon is concerned. That is the reason. Money—that's why. There is no other reason.

Analyze conditions. Am I right? If I am, permit me to suggest several reasons for a better way. Many men, particularly the younger men, think that the great volume or number of patients treated each day is an index to their business efficiency or success. This is absolutely wrong and marks inefficiency and failure.

It is impossible, as impossible means, to concentrate upon an operation and give the best service, if the surgeon allows himself fifteen minutes to perform that which should consume thirty minutes. The man who permits himself to become too busy, invariably slights detail at the expense of perfection. Needless to say, this is a serious injustice.

It is deplorable that fifty to eighty per cent. of the dental operations done to-day will have to be done over within one to five years. While this damnable haste and insincerity is being practiced, can we blame the laity for neglecting their dental needs? Certainly not.

At this point permit me to state, in consideration of the fact that less than ten per cent. of the needed dentistry is being done, there is no such thing as competition in dentistry. Every man is as busy as his ability to instruct has made him.

"Oh, what a tangled web we weave when first we practice to deceive." That's the trouble; we are deceiving ourselves, and, not only that, but deceiving those who are near and dear to us, the good people who believe in us and have confidence enough in us to place their mouths and their health in our hands; the people who pay us the money with which we buy our clothes and bread; we are deceiving them.

We cover it up with nice names; and right here is the trouble, we will not admit the truth. It is crooked, gentlemen, it is crooked! There is no difference in dishonesty—it is all in the same class, whether it is stealing, cheating, lying, swindling or wasting time. It is all the same thing.

Tell the truth to everybody and to yourself about everything, all of the time. Loyalty wears the honors, disloyalty the rags. Sincerity is the most vital word recorded in the dictionary, and service is the keynote of success.

Most men who slight technique do so because it is next to impossible to get sufficient compensation for the time necessary for the practice of perfection. Is that a true statement? If it be true, we are deficient in our salesmanship.

Salesmanship.

What is salesmanship? Salesmanship is the power or ability to influence people to buy at a mutual profit that which we have to sell, but that which they may not have thought of buying until we called their attention to it.

Salesmanship is the battle of organized knowledge against unorganized ignorance. Salesmanship is the ability to tell the truth and create a favorable mental sensation in the prospective customer's mind. Salesmanship embraces seven mental processes: First—The introduction. Second—Attention. Third—Interest. Fourth—Conviction. Fifth—Desire. Sixth—Resolve to buy. Seventh, and most important—Close the order or influence the prospective to act.

Remember that no chain is stronger than its weakest link; and that all the mental processes are no stronger than their weakest one. In other words, your ability to handle all of the mental processes is no stronger than your ability to handle the one that you are least able to handle. No mental process is stronger than it's weakest link. Failure, therefore, may be the result of a little weakness.

The instant man shall find the fault within himself and correct it he is in condition to grow.

The first thing for a salesman to do is to get on the customer's side of the fence. Show the prospective wherein your service will be of value to him, remembering always that salesmanship is the ability to tell the truth.

There are so many truths regarding the importance and value of dentistry that no intelligent dentist should lack for language to interest any prospective patient. A good salesman, then, is an expert advisor.

Who made the National Cash Register Company famous? The sales-manager.

Who made the Ford Company famous? The sales force.

Who makes any business successful? The men who dispose of the products.

It is easy to manufacture a thing, but it is hard to dispose of it. Why do people buy? Is it not because of the profit they expect to make or the good they expect to receive?

We are beginning to see that we have failed to enlighten the laity as to the true value of dentistry. But you say that the average man earns less than fifteen dollars per week, and cannot afford to pay for hours of instruction and prophylaxis.

Let us see whether it is inability to pay or lack of understanding.

We have thousands of music houses from which instruments worth from $250 to $500 may be purchased upon the instalment plan. Automobiles, summer homes, jewelry, clothes, and almost anything else may be purchased in the same way. Are thousands of people not buying many things that they might well do without and neglecting to secure the necessities of life, and is their neglect not largely due to your and

my failure to have informed them? Is it not more important to have the knowledge of hygiene which will not only prevent diseases and decay and lengthen life, but make life worth living? There is but one answer. Yes!

Would you prescribe? Would you consult? Would you instruct and prevent disease and decay if you could make more money and do more good in less time than you have been able to do in the past with beautiful repair work? Surely you would.

Would it be a pleasure to you to feel that you are rendering every patient a life service? Would you like to know that you are doing your share toward stamping out disease and lengthening human life? Of course you would.

Do you want your value to be contained within the four walls of a tooth cavity or capped over an old broken-down root and stop there? If not, I beg of you in the name of humanity, see more than repair work. Find the cause of disease and remove it. Establish normal, cleanly, healthy conditions and teach those depending on you how to maintain them. Give real service and charge for it.

We know that disease is of germ origin. We know that the mouth is an ideal germ hot-bed. We know that germs must have rest in order to develop. We know that tooth decay never begins on a clean surface. We know that unclean surfaces become filthy. We know that filth produces irritation. We know that excessive irritation interferes with nutrition, lowers vitality and permits of inflammation. We know that in inflammation the arteriole and capillary walls soften, permitting exudation. We know that the function of the white blood cell is phagocytosis. The blood cells having no firearms must fight in direct contact with infection which produces said inflammation.

What becomes of the dead and wounded soldiers? Do the blood and lymph carry them away? Where are they taken? What are the functions of the lungs, liver and kidneys? Do these organs ever become overworked? Time will not permit my answering these simple questions.

What happens to a rabbit or a guinea-pig in the experimental laboratory after tiring or wearing him out? We will not resist nearly the dose of poison that we will when in a normal rested condition. That is a natural law, and I want to impress you here and now with the fact that the laws of the universe must be remembered and obeyed.

It is comparatively easy to explain tangible things, so let us make visible rather than imaginary illustrations and arguments.

Cleanliness Most Important.

The average individual thinks he is comparatively clean, while his mouth is really filthy. He thinks he is clean because he does not know what constitutes cleanliness. He has no conception of the

minuteness of the vegetable organisms which flourish in the human mouth, nor does he know how to prevent their growth.

Whose business and whose duty is it to instruct him? It is *yours* and *mine.*

This can best be done with the aid of a staining solution. Mucous placques and inflamed tissue show plainly, and their significance may be explained in the simple manner just described.

There no longer exists a question as to the fact that infections are carried by the circulating mediums. This being true, patients should be impressed with the importance of absolute cleanliness. Cotton should be wrapped on a toothpick to show how to stain the teeth. The patient should be given a prescription for the staining solution so that he may keep posted all the time as to his cleaning methods. He should be instructed as to the use of dental floss, wood points, cotton rolls, finger massage, and any and all other efficacious cleaning methods.

Such practice will produce great results and appreciation. Decay will be prevented and disease arrested. That, gentlemen, is the greatest service that can possibly be rendered.

3. How does prophylaxis compare with repair work? Like an ounce of prevention compares with thirty-seven pounds of cure. As the telegraph, telephone and wireless compare with the messenger. As the gasoline machine compares with the ox-team. Or as the electric lamp compares with the candle.

4. Who profits most? He who serves best and makes his service known without a doubt. He who truly serves from the bottom of his heart as he would be served and makes that truth known without the appearance of selfish interest. He who knows the value of his service and has the ability to impart a knowledge of that value without offense. He whose very presence is an inspiration of truth and whose enthusiasm bubbles over, enlightening the susceptible minds of all those who know him. He who works because he loves to behold the good he is doing. He who through good business can draw about him a class who may truthfully say, "The world is better for his having lived!"

5. Are you willing to do all in your power to prevent oral disease?

Are you willing to show every patient just where his weakness is? What a noble mission. Realize that in order to do this great, good thing we must first make of ourselves real men. Realize that making good is a duty—an issue that cannot be dodged. There is no duty that you can shirk, no task that you can leave undone that will hurt anyone half so much as yourself. So remember, "Loyalty is one of the most beautiful words of the English tongue, and that we *get* by *giving help.*" There is

a great deal more to life than mere dollar getting, and he who gives himself to his work, body and soul—with a sincere desire to give to the people he does business with the same, and above all a square deal to himself—that man is marching through the brilliant avenues of the future to the City of Big Things.

Realize that a new day is here and permit me to say with Elliot, "Should by chance anything that I may ever pen go down on the great record-book of Time, I would that it be these words, etched on a page of bronze, to go thundering down the ages: Work, be square and love. Bury your very soul in a religion of hard work. Anoint yourself with the oil of honesty, love and sincere and earnest desire to bless and benefit in everything you do or undertake."

Pyorrhea Alveolaris.

By John S. Engs, D.D.S., Oakland, Cal.

Since 1896 I have paid pretty close attention to those of my patients who suffered from that most destructive affection of the masticatory apparatus, known as "pyorrhea alveolaris." In its early stages the trouble is too often disregarded, or, if noticed, attributed to neglect of mouth hygiene on the part of the patient. The affection is of the tooth joint and not of the tooth itself, though the latter is frequently lost as a consequence of neglect. In its primary stage, hyperæmia of the tissues is its principal diagnostic feature. This may be demonstrated by slight hemorrhage following pressure of the fingers on the gums surrounding the necks of the involved teeth. Tartar may or may not be present.

Symptoms in Advanced Stages of Pyorrhea.

The pyorrheal stage of the disease (usually an advanced one) is probably due to infection by the many pyrogenic organisms constantly found in the mouth. The infection seems most pronounced where the patient is in a run-down condition. But great destruction of tissue may take place without pus infection. The trouble seems to begin at certain places in the jaw; particularly in the region of the bicuspids and molars, though it is occasionally found associated with one or more of the anterior teeth. The tissues surrounding the roots of the second bicuspids is a favorite point of attack. In the more advanced cases the molars (usually the upper) and the lower cuspids are the greatest sufferers, gradually losing their attachment to the jaw. Usually the attachment of the roots is lost on one side only. In multi-rooted teeth, loss of attachment frequently involves the whole of one root to the apex, while on the others it is limited to one side, or a portion of their length, commencing at the neck of the tooth.

In the more advanced cases of this disease two types are prominent.

In one, vital connection with the jaw may be lost entirely on one side of the root or roots up to and including the apex, the surrounding tissue being highly congested. The insertion of an instrument between the soft tissues and the tooth at that point results in a profuse hemor-

rhage. The bleeding is not free, however, because the blood almost instantly forms in a thick clot. I believe that this type is one that presents the greatest obstacle to successful local treatment. It is not characterized by excessive deposits of calculus under the free margin of the gum; neither is there marked evidence of pus. The other type is marked by excessive deposits of dark green calculus covering the roots, to a greater or less extent, in some instances from neck to the apex on one root. I have seen cases where the deposit was confined to the apex alone, where it was found after extraction of the tooth, forming a ball or knob as big as a large shot. This type is usually found with the root lying in a well of pus that exudes upon pressure or in masticating food.

The result of my own observations leads me to believe, with many others, that in the majority of cases so-called pyorrhea alveolaris has its origin in fault of nutrition, either of dietary or metabolic origin. My belief is based on the observed fact that the application of measures for the correction of those faults leads to improved conditions. If after the roots of the affected teeth are entirely freed from all concretions and shreds of diseased tissue a rigid diet is followed, and such measures as will insure health of the body adhered to, the improvement will increase, and in many instances a permanent cure will be attained. Even in the less promising cases, if the directions for home treatment are carefully followed, the affection can be held in check. Such cases will show remarkable improvement if treatment is resorted to intermittently, say every three to six months, for a period of two to three years. We must not lose sight of the fact that the affection is not of mushroom growth. It has generally taken years to establish itself; consequently we must not look for a spontaneous cure. To those who would apply themselves to the correction of this ailment I beg to offer a few suggestions, as follows: Before attempting to alleviate human suffering of any kind, whether it be a sickness of the mind or of the body, we should first of all prepare ourselves for the task by a thorough investigation into the causes or events that led up to the disease. Let us be sure that what we observe is in itself a disease, and not a condition resulting from another, before we begin treatment. This rule applies particularly to the subject of this article; for I fear that many of the reports of so-called cures from instrumental treatment were not cures of "pyorrhea" (interstitial gingivitis), but of simple pyorrhetic inflammation of the gum margins due to irritation from extensive deposits of calculus, or débris, due to uncleanly habits. If we rely, as many appear to be doing at the present time, upon local treatment alone, time may find us in the position of those of our medical friends who treat an alveolar abscess with fistula opening on the chin, through the fistula instead of through the tooth.

Etiology.

The influences which may incite this affection are so numerous and dissimilar, so apparently contradictory to one another, that the scientific world has not as yet been able to agree upon any specific cause. It is known, however, that where the health has become undermined by debilitating influences and broken down by injudicious habits of living, the disease is apt to appear in its worst form.

That opinions differ regarding the etiology (by which is meant, placing the first cause) of pyorrhea is not strange when we read of the remarkable "cures" attained through means quite different from one another. Here are those who stake their faith on germs, using an unfailing remedy, autogenous and stock vaccines; there are the advocates of instrumentation alone, and at last, with equal confidence, we are told that they are wrong; and only those who fight the battle, armed with that disturber of gastric peace, emetin, recently added to our armamentorium, may hope to win; because they believe that this terrible affliction is due to the presence of a creature with many attributes, and which is a more or less constant inhabitant of the digestive tract. In regard to the last remedy, I might add that Dr. Harvey W. Wiley informs me that "his very dear friend, John Uri Lloyd, of Cincinnati, not long ago discovered a remarkable property of hydrosilicates of combining completely with all kinds of alkaloids, thus removing them completely from solution. The Lilly Co., of Indianapolis, have applied this principle to a preparation of ipecac or emetin by means of which the active principle can be introduced into the small intestine where it is set free by the alkaline medium. A weak acid does not decompose this compound of emetin with the hydrosilicate." While the evidence seems to show that in many instances treatment with this substance has been helpful, it does not prove it to be a specific for the disease. It seems to be worth trying, however.

I once asked an essayist if he wished to convey the idea that pus is always present in pyorrhea alveolaris? He said "yes." But I think that his answer was due to a restricted use of the term "pyorrhea," without sufficient regard for the pathogenesis of the disturbance.

Guided by experience, gained through practice and observation, I feel quite safe in following a course of treatment suggested by Dr. Talbot's statement that "seventy-five or eighty per cent. of the cases of pyorrhea that come to us are due to constitutional causes." Such cases cannot be brought back to health by local treatment alone. Of course, thorough scaling and cleaning of the teeth will greatly improve local conditions. But if we desire anything approaching a permanent cure, it

will be necessary first to search for the underlying cause and correct it. Any prolonged irritation of the tissues surrounding the necks of the teeth, whether due to toxins in the blood, uncleanliness, mechanical force or deposits of tartar may incite the disease. Injudicious regulation of teeth is at times an exciting cause, while badly fitting crowns and bridges certainly furnish good fields for the development of conditions leading up to the pyorrheal stage. So I think that we should not confine ourselves strictly to the removal of deposits when handling our cases. In the past it was common for patients to be told that "nothing can be done for your teeth. In five years you will lose them all." Such remarks are getting less common, however, for daily demonstration of what can be done through selective treatment is continually being made. Our clients are beginning to realize that those who make such statements are neither true to their own interests nor do they give to their patients the best that modern dentistry has to offer.

Treatment.

It was not my intention when gathering material for this article to say anything regarding my own methods of treatment, for two reasons: First, because you may get it all at first hand if you read carefully Dr. Talbot's work on *"Interstitial Gingivitis"*; secondly, while I believe, many do not, that we dentists should acquire greater familiarity with diseased conditions of the oval cavity (other than dental caries) through closer study of pathology, so that we may appreciate the relationship between them and various constitutional disturbance which are believed to be their predisposing or exciting factors. That last sentence sounds rather like a "stock quotation." Whether there is any money in it will depend somewhat upon ourselves. The point is this: Dentistry has reached a plane where much is expected of its practitioners. But if we are to give our patients all that they have a right to expect in the way of service we must use brains as well as hands. I once read of an incident which ended the life of a man and made a hero of him. Passing by the retaining dam of a reservoir he discovered water escaping through a small opening. He plugged it up, but in a few moments it broke out in another place. This continued for some time, the stream of water becoming bigger and bigger. He saw that the only way to save a town in the valley from destruction was to plug the hole from the inside of the dam. Help being far away, and his own remaining days of uncertain number, he sacrificed them by diving down and plugging the opening on the inside. He thus saved the town by imposing his body against the destructive force of the water. And I think that we also may successfully combat this burrowing force that is slowly but surely breaking down the walls that retain the

most important organs of our body, if we oppose it from the inside. That a cure can be attained I am convinced. It will take time, however, and the hearty co-operation of the patient.

Lime Deposits.

As regards lime deposits, I feel that if the process of nutrition is properly carried on there will be no excessive deposit of calculus, either salivary or serumal. Consequently, there will be no great need for instrumentation.

The name pyorrhea does not satisfy me at all, for I think it is misleading in that it suggests one stage (an extreme one) of the disease when pus is present. We should not wait until conditions have reached that stage before beginning treatment. In all walks of life we find very few individuals who exercise good judgment in the matter of eating. So to this and lack of exercise we may attribute most of the ills to which "flesh is heir." Of late the world seems to have gone germ crazy. Diseases of all kinds from love to leprosy have been attributed to their activities. And yet they are really harmless things, unless grown in favorable mediums which tend to bring out their virulent properties. Such a medium is furnished in the overfed or underfed human body. If the body is healthy and properly nourished we need have little to fear from germs.

Diet.

Those under treatment for incipient or chronic *interstitial gingivitis* (unless contraindicated by some organic disease) should eat freely of fresh vegetables every day, particularly succulent uncooked ones; all the fresh fruit they can when it is in season, and unless engaged in hard manual labor or taking violent exercise, very little meat. Sufficient protein to meet the body requirement of the average man may be obtained from eggs, milk and milk products. This diet will be found to be better suited to those who are engaged in literary pursuits and other occupations calling for mental rather than muscular efforts than one in which meat is the principal item. The need of meat in the diet is becoming less and less apparent. Dr. Wiley also calls my attention to the belief of most authorities at present that the best food for hard-laboring people is composed mostly of cereals; by which, of course, is meant preparations containing all of the grain, not white flour bread. A neighbor of mine told me recently that while taking a course in one of the German Universities. two years was spent on practical work at the factories. While there he worked from seven o'clock in the morning until nine o'clock at night. He had three meals a day, each of them consisting of black bread with cheese

and a light beer of low alcoholic content. He said he never felt better and weighed twenty pounds more than he does now.

When treating this affection of the tooth socket we should caution our patients to avoid excesses of all kinds, and above all things to have patience while awaiting results. A complete return to health is not a matter of a week, but rather of months, and frequently of years. But if treatment is conscientiously carried out the mouth trouble will be overcome and likewise other joint troubles in remote parts of the body. The latter are too frequently of late attributed to pyorrhea, whereas in all probability both the pyorrhea alveolaris and the arthritis had their origin in some fault of nutrition in the general economy of the body. Correct this and build up the general system with proper food and we shall have no need for germicides, antitoxines or autogenous vaccines.

We should bear in mind several things when considering the merits of the different methods suggested for treatment of pyorrhea alveolaris. I fear at times we jump to hasty conclusions and give undue credit to some methods of treatment without taking into consideration the benefits derived from operative and systemic technique carried out in connection with them. It is an observed fact that only after the application of remedial agents for a period of four to eight weeks can we look for any radical change for the better, indicating a return to normal functional activities, especially in localized lesions associated with a general autointoxication. It is therefore vitally important that we should impress this fact upon our patients; otherwise they may, as sometimes happens, become impatient and discouraged because a return to health is slow. While in that state of mind they are easily persuaded to try some other method. The latter may then gain credit it does not deserve, which by right belongs to the first treatment, as a result of the cumulative action of previously applied remedies. This I think especially true of the work which is done by dentists when assisting medical men with their pyorrhea alveolaris patients. If you will read the pamphlets and short notices by manufacturers of remedies and exploiters of the same, you will notice that the services of the dentist are called upon as a sort of adjunct to the "real thing," whereas in all probability any benefits that may have accrued were due largely to his prophylactic work.

Pyorrhea Alveolaris, and the Constitutional Relationship to It and Other Dental Diseases.

By Claude Emory Markey, D.D.S., Pasadena, California.

In presenting this paper on pyorrhea alveolaris and the constitutional relationship to it and other dental diseases, let it be understood that I practice prophylactic treatment, polishing and thorough instrumentation of a Carr man and that furthermore I advocate the study of diet and the study of Nature's laws, with the idea ever in mind of placing tissue resistence and body secretions in a state of health, whereby they may exert their normal action of *immunity*.

I do not discredit nor even discourage those who claim to obtain permanent results by local treatment, *alone*—but by combining the oral treatment with a rational common sense interpretation of our duty to Nature, I believe one is able to obtain better results and at the same time have a tendency to raise one's standard as a professional man.

Diagnostic Symptoms in Pyorrhea.

Typical pyorrhea alveolaris is a disease whose diagnosis is certain—but whose prognosis is uncertain—a disease of the tooth socket in which a flow of pus from the alveoli is the chief diagnostic symptom, other characteristics being inflamed gums, looseness of tooth, tenderness to pressure and perverted function. A calcarious serumal deposit is generally found upon the root; firm, barnacle like, though I have seen cases where roots were as smooth as though polished, yet with pus very much in evidence.

Etiology of Pyorrhea.

In my early practice I considered pyorrhea as simply a disease of filth and neglect of the oral cavity, but from study and close observation I now believe it to be just as much an oral manifestation of some constitutional disease (a result of auto-intoxication or self-poisoning) as it is an evidence of neglect of oral hygiene.

The conditions around the teeth—as regards malocclusion, irregularity, rough margins of fillings or crowns—poor contact points—abuse by toothpicks and neglect of oral hygiene—to be sure, may be considered as important predisposing causes.

It is claimed that if a tooth afflicted with pyorrhea, be extracted, the gums will heal, and that that ends the pyorrhea. To be sure, it ends it as far as the tooth is concerned, but is there not another factor which enters into consideration?

Nature must have some outlet for her over-accumulated poisons and waste, and when the excretory organs are overworked (as is usually the case), then the weakest tissues suffer; tissues of poorest circulation, of poorest stimulation, and the end organs and joints afford a very favorable location for their lodgment, especially the *immovable joint* formed by the cone shaped root and its socket, the joint known as *gomphosis*.

If pyorrhea were simply a disease of filth of the oral cavity, then why is it not in evidence in the mouths of young people, as in accordance with filth of oral tissues it should be in evidence, in some cases, as early as the fifteenth year?

Why does pyorrhea recur, as is often the case, after a supposed cure —after thorough scaling and local treatment and where the patient has co-operated with the dentist, as regards daily care of the teeth, use of dental floss and massage of gums? Why does it recur, unless there be some hidden cause not fully understood, together with the fact that the dentist was treating the symptoms alone, by local treatment, instead of treating the symptoms and deep seated cause by local and constitutional treatment?

According to my observations, pyorrhea patients belong to one of the following classes:

1. Those of poor circulation.
2. Those who drink very little water, or eat very little fruit.
3. Those who are hearty eaters.
4. Those who are rheumatic or gouty.
5. And last, and probably most important class of all, those who are constipated and take no regular form of exercise.

Did it ever occur to you that Nature plays no part in the restoring of lost tooth structure, due to dental decay (one part of the body she cannot repair), but that in the treatment of inflamed gums and pyorrhea, she stands ready to assist you if you will but give her the opportunity?

Gingivitis and stomatitis often manifest symptoms in the mouth, as a result of inflammation of the alimentary tract, due to wrong living, errors of fermentation—and if one is to enjoy the full benefit of the profession of dentistry, he must realize that general pathology and general health must be understood and reckoned with in the proper treatment of the oral cavity, and especially so in the treatment of pyorrhea alveolaris.

Who questions but that the oral cavity is, to some extent, affected by systemic conditions? Any change in the metabolism of the body is just as liable to have its effect upon teeth and oral tissues through their nerve, blood and lymph supply, as it is upon any other tissues of the body, but the true relationship between oral and systemic conditions has not been as fully recognized as it should be.

Dental diseases go hand in hand with other degenerative changes in the body. Any great amount of dental trouble is but an external warning that something is wrong within the body, and hence our body resisting secretions—blood, lymph and saliva—are in a state of lowered resistance. The saliva (that wonderful indicator of health conditions, being a secretion from the salivary and mucous glands and indirectly from the blood) plays an important part either in predisposing, or as an agent of immunity as regards dental caries and the precipitation of calcarious deposits on the teeth, though just how it does it is yet undiscovered.

Saliva.

The saliva *retards* the action of most acids, up to a certain degree, and it has been stated that a saliva and lactic acid solution is from ten to twenty times weaker in its effect on enamel than is a water solution of the same strength of acid. The saliva should be as valuable a means of diagnosis for the dentist as the urine is for the physician, and more study should be given to its analytical investigation and, if possible, some method worked out whereby the acid resisting power of various living salivas could be tested upon living tooth structure. Saliva being a living substance, will vary according to stimulation and general health, whereas saliva in constant excess is a disease known as ptyalism.

Etiology of Pyorrhea.

Pyorrhea occurs about middle life, or at a time when other manifestations of disease may appear in various tissues of the body, as a result of some material or body waste being brought by the blood stream, and through some gradual and long continued obstruction or morbid structural change.

Typical pyorrhea is a disease of constitutional origin, manifesting itself in the tissues surrounding the teeth. It occurs about middle life, or at a time when other manifestations of disease may appear in various tissues of the body, as a result of some material or body waste being brought by the blood stream, and through some gradual and long continued obstruction or morbid structural change, a mass of tissue results, which (from lack of nutrition) is liable to undergo degenerative changes, producing a condition which is as the Greek translation of pyorrhea alveolaris implies—i. e., a flow of pus from the alveolus or socket of a tooth.

Uric Acid Theory.

It is now claimed that the uric acid theory has been exploded, but inasmuch as no reason can be given for its presence in rheumatic conditions—or joints, or its presence as urates in some cases of serumal calculus as shown by murexide test—we will need (for the present at least) to consider the urates as important pathological factors in many tissues of the body. As long as uric acid can be oxidized it is of little harm, but when its supply is so great that it cannot be readily oxidized, then the tissues throw it off unoxidized, and as such it becomes an irritant to tissues.

The kidneys filter and remove from the blood uric acid and other poisonous waste, resulting from nitrogenous metabolism.

It takes years to produce a true pyorrhea—whereas it requires but a short period of neglect of oral hygiene to produce a filthy mouth, and hence neglect of oral hygiene should be considered as a cause of true pyorrhea, in so far as it predisposes or reduces resistance of oral tissues.

Some years ago the most frequent cause of death was tuberculosis—while to-day the most frequent cause of death is organic heart disease, and in some sections the mortality rate from organic heart disease has increased ninety per cent. I believe a large per cent. of these deaths could be postponed, if we could educate people to the fact that the best means of reducing high blood pressure is through hygiene, exercise, diet, and rational living.

Diet.

Our modern diet has a tendency to reduce resistance; much of our food is, in fact, predigested and robbed of its mineral salts, and often in such a form as to require little mastication; anything which reduces resistance means, sooner or later disease. Hard, resistant, dry foods give abundant exercise to the oral tissues, and at the same time stimulates and develops our digestive organs; and moreover, by their thorough mastication, they help to clean the surfaces of the teeth. Eat less and chew more—your stomach has no teeth. Stuffing and strength are not correlated.

Food that gives strength is that which is compatible, well masticated, insalivated and properly assimilated. The stomach is not a cellar nor a store house for food, it should have its time of rest the same as other tissues. Be regular about your meals, eat plain food and not too many mixtures, and when one considers that the secretions of the ailmentary tract must act upon one's food and help prepare it for absorption, and that they can do their best work only when in their full strength, does it not sound reasonable that one should avoid drinking liquids with meals, thus diluting and weakening the digestive fluids?

The body is about two-thirds water, yet few people drink enough water. The habit of drinking water (often ice water) with a meal, should be discouraged, because anything which reduces the temperature or chills the stomach, while digestion is in progress, simply means that extra energy (waste energy) must be used to restore the normal body temperature before digestion will proceed normally. Thorough mastication and proper insalivation of one's food is very essential, as by thoroughly masticating one's food the salivary glands are stimulated to pour out their secretions and thus the ptyalin of the saliva has a better chance to act upon the starch. Raw starch is very difficult to digest and, unless predigested by baking (320° F., or higher), or given plenty of time to be acted upon by ptyalin of saliva, the starch will receive insufficient ptyalin to change it into sugar; hence when food reaches acid gastric juice of the stomach (where action of ptyalin is checked, due to acid media) the unchanged starch remains in the stomach and is later acted upon by alkaline digestive fluids of the intestinal tract.

It is unwise to eat when ill, worried or excited, as the mind and nerves exert a powerful influence over digestion. Air is the most important factor in life. Aim to have plenty of fresh air in bedroom during sleep, or better still, sleep on an open porch. Avoid foul, stagnant air as one would avoid poison. Next in importance is water—and though a person may go for a short time without drinking water, in such case he must obtain his liquids through fruit, vegetables or other food.

Of the classes of food, I believe *fruit,* when eaten alone, or a meal made of it, is the most healthful food we have—it being Nature's own food, and thus one obtains his sugar in its true natural form. Each year the United States consumes over one hundred pounds of cane or artificial sugar per person, and that in itself is one of the causes of increase in diabetes, liver and many catarrhal troubles, and I fully believe many of the ills of man would be overcome if fruit sugar were given the place in our diet that the Creator intended it should occupy. The acids of fruit interfere with starch digestion, if both are eaten at the same time, while fruit acids aid the digestion of albumens and fats.

Men at sea, if without fruit for any length of time, become rheumatic and develop spongy pyorrhea gums; so fruit is not merely a food, but is Nature's best medicine, increasing the alkalinity of the blood and aiding as a solvent of waste acid tissues. The salts of potash and the acids contained in fruits are excellent for purifying the blood of uric acid deposits, the acids of the fruit being oxidized in the body and converted into alkali.

People who feel they must have "sweets," should satisfy their "crav-

ing" by eating fruit, honey or maple sugar. An apple, orange or some pineapple a day, "keeps the doctor away" is a saying which merits some thought. Take an occasional fruit fast. Eat only fruit for a day or so, thus aiding Nature in removing the over-accumulated poison from the system.

To anyone troubled with acidity of the stomach, the juice of an orange, slowly sipped, half hour before breakfast, is an excellent tonic for the entire system. An orange quenches the thirst, and, while traveling, is much more healthful than stale water.

Food when digested and assimilated, should produce an *alkaline* rather than an *acid* condition. Fruit and vegetables tend to produce an alkaline condition.

People have inherited the idea that it takes many articles of food to constitute a good meal, likewise that *meat* is "the" substantial and principal article of food and that other food is merely prepared to go with it and make the meat taste better. Also have they inherited the idea that *cereals* and cereal products are the next most important food. A study of the chemistry of food reveals the fact that meat contains no nutriment but what may be supplied from other food and also the fact that meat contains poisons which other food does not contain. The only nutritive elements in meat are proteids and fats, and they may be obtained from milk, eggs, olive oil and nuts.

It is impossible to eat any kind of flesh food without taking into one's system some uric acid and poisonous waste which was in the process of digestion or elimination when the life of the animal was arrested by death. Food is a stimulant; over eating means over stimulation. Most meat is easily digested and very stimulating, but constant over eating of meat is one of the causes of enervation, debilitation and self-poisoning.

The use of *buttermilk* and *cottage cheese should be encouraged,* as it one of our *best foods,* and helps relieve fermentation.

Someone states that white bread is the staff of life, but I believe the individual who said, that, for a person over thirty-five years of age, white bread, cakes and pastry are the "staff of death" came nearer the "truth."

A bushel of wheat will produce twenty per cent. *less* white flour than whole wheat or Graham flour, while whole wheat flour retains more of the mineral salts and assists the peristaltic action of the digestive organs.

One of the most common errors of diet is using sugar and cream

upon a mushy or soft breakfast food, thus requiring little mastication, and producing, by the incompatible combination (*starch, sugar and cream*) fermentations and gases within one's system.

The excessive use of cane or artificial sugar is becoming (of itself) a national disease, as without sugar there can be no fermentation, and fermentation produces acids which act as irritants to the mucous membrane of the alimentary tract and continued irritation is but the beginning of catarrhal trouble. I believe thousands of persons are, to a certain extent, intoxicated, from their own waste matter (fermenting vats) and the average person has little knowledge of the alcohol produced within their system through errors of diet (fermentation).

Hurried, nervous eating, over eating and bolting one's food, are all habits, which may be overcome by giving attention to diet.

The use of salt and sugar should be discouraged. The natural salts contained in vegetables (and many of them directly beneath their outer covering) should be retained, chiefly by baking, and not thrown away "in solution" in the water in which they were boiled.

Every chemical element which the body requires may be obtained (and in their best form) from the vegetable world.

Eat plenty of salads and raw green vegetables, thus obtaining the necessary iron and mineral salts required by our systems.

And use olive oil and a little lemon juice as a salad dressing.

Our body may be considered as a living engine. Give an engine improper fuel, lubricant or lack of attention, and you decrease its efficiency. Our food is our engine's fuel. Most disease is associated with fever (heat), so shut down your fuel (food) and give your engine (digestive organs) a chance to return to normal.

Can disease which is primarily associated with errors of diet and abuse of Nature's laws, be cured by continuing the habits or increasing them?

History shows that the more civilized a nation the more sickness, and yet it is only in recent years that intelligent people have taken time to find out *what really is at the root of disease.*

Break down a person's resistance by errors of diet and abuse of Nature's laws, and it requires but little to break the barrier between health and disease.

Thousands are slaves to alcohol, tobacco, coffee, tea or other drugs, and add to that the folly of stuffing and wrong living and is it any wonder pyorrhea and tuberculosis are common diseases?

Appetizers Injurious.

Many people seem to think they must have an appetizer, be it liquor, tea, coffee, condiments, jams or the like, and the more they indulge in these errors of diet, the more it will gradually require to stimulate their appetites, until a time comes when the digestive organs rebel, due to over stimulation, over feeding and debilitation, and then one awakes to the realization that "It is the simple life that counts."

Function of the Skin.

The pores of the skin are continually throwing off body poisons, hence should be kept open. When the pores become closed these body poisons must be taken care of by the circulation and carried to the lungs for oxidization, but as a rule the lungs are pretty busy attending to their normal share of body poisons; hence the importance of healthful exercise and a good sweat.

Deep Breathing.

Practice deep breathing, as it is one of the best means of removing the body poisons, at the same time aiding in peristalic action.

A good practice upon arising is to take several deep breaths of fresh air, then rinse the mouth with a very *weak* solution of lemon juice drink some water and if convenient, some orange juice, and take from one half to an hour's exercise, preferably out of doors, around the garden or the like. Aim to get up a sweat, followed by a cold bath, and a brisk rub with a heavy bath towel, and from my own experience I know that an hour thus spent, say from 6:00 to 7:00 A. M., is as good an investment for health as one can make, and I would encourage all dentists to give the subject of health more thought, as no profession requires more attention to health than dentistry.

Are we as dentists doing our full duty to our patients when we simply limit ourselves to the oral cavity? Or should we use our broader education and instruct our patients as regards the part diet plays in one's general health?

It has been my experience that too little attention is given this subject, and it is my belief that were as much study given to compatibility of foods as is given to compatibility and action of drugs, our average as far as health is concerned, would be much higher than it is to-day

Tooth Polishing.

Many of the foremost men in our profession have demonstrated (by careful and thorough instrumentation) apparent cures of pyorrhea, but who can claim that they are able to improve on Nature's normally finished tooth surface and at the same time leave the tooth absolutely normal?

It is true we can produce a beautiful polish on a tooth and improve on faulty tooth formation (due to heredity or diseases of childhood), and thus apparently leave less means of attachment for deposits, but unless we are able to leave that tooth able to perform its normal functions, we have not improved on what Nature *can* (but in reality does not always) produce; however, I believe that by our system of polishing we perform valuable prophylactic service.

Sensitive Cementum.

We also have the sensitive cementum to contend with and where much absorption has taken place all one can hope for is a snugness of surrounding tissues at the line of absorption, and in some instances a rebuilding of osseous tissue to or nearly to the heighth of absorbed points of alveolar process has been shown by radiographs.

If, as in many cases, the teeth are left sensitive to temperature or acids, at cementum, dentin or enamel junction we have a condition which does not permit the normal function of the tooth.

Dr. Talbot considers the alveolar process which holds the teeth in the jaws, to be a double transitory process and an end organ, and therefore, is one of the first, if not *the first* structure in the body to respond to constitutional irritation, such as metal or drug poisons or auto-intoxication.

He places emphasis on gum massage, good health and placing of elimination organs in normal condition, all of which I advocate, and also do I use, in some cases, a massage of gum tissues by high frequency electric current, with the object of increasing circulation in the diseased tissue.

Pyorrhea is such a universal disease and of such vital importance to mankind in general, that we should study the disease from every angle and use every means possible to ascertain its real cause and thus render true service to suffering humanity.

Diagnosis.

We have two quite different pathological conditions to study; conditions which differ as to their cause—appearance, treatment, locality, chemical analysis and prognosis.

One is concerned with those surfaces of the teeth which are bathed in saliva (interstitial gingivitis) and the other with those surfaces of the teeth which are bathed in blood (pyorrhea alveolaris), and while the inflammation of tissues surrounding the former may end in resolution or suppuration—yet, as a rule, with simple treatment the tissues return to normal, while in the other conditions we have a more difficult task before us, and one which imposes a heavier burden upon our reparative tissues.

In pyorrhea the chemical analysis of calcic deposits (commonly called serumal calculus) shows sodium and calcium carbonate—and has shown urates and uric acid crystals—demonstrating that the insoluable salt of the deposit is a precipitate from the blood lymph, and hence an irritant to cemental membrane, and that pyorrhea belongs to the arthritic diathesis class.

Uric acid crystals, owing to their non-diffusibility, are not freely eliminated from the blood by the kidneys. They are neutralized and dissolved mainly by salts of potassium—sodium, calcium and magnesium—which are contained more in green leaf vegetables and fruits than in meat and cereal products.

In the treatment of any inflammation of the oral cavity or in the treatment of *gomphiasis,* whether they be as a result of stomatisis, pericementitis, interstitial gingivitis, or pyorrhea alveolaris, it is the duty of the dentist to call the patient's attention to it and give his conscientious advice and suggestions of proper treatment.

There is no denying that focal infection of the oral cavity is an important pathological factor, because the absorption of pus and concretions must necessarily exert some toxic action—depending upon the resistance of tissues, antiseptic action of body secretions and the general health of individual.

The question of personal equation, immunity and susceptibility are subjects each of which opens up a wonderful field for research work, and the sooner we are able to solve these questions the sooner will we be able to practice true oral and constitutional prophylaxis.

A clean tooth will not decay, nor will a clean body become diseased.

In connection with oral diagnosis of focal infection, and in examining for devitalized teeth, I know no better means than the radiograph, and for stimulation and massage of the oral tissues, I know no better way than the high frequency electric current.

New Name for Pyorrhea Proposed.

The names "pyorrhea alveolaris" and "interstitial gingivitis" are the generally accepted terms, but involving the peridental membrane, cementum and the articular joint, as they do, it has occurred to me that the disease in question might be called "gomphitic arthritis" or "pericemental gomphitic arthritis," which may be suppurative or non-suppurative. We might then refer to a tooth in such a condition of looseness or inflammation as suffering from gomphiasis. The articulation is a joint of the synarthrosis type, belonging to the same classification as the sacro-iliac joint, and one may have inflammation of that joint (the term being sacro-iliac arthritis). The peridental mem-

brane in its structure and function is somewhat similar to the synovial membrane, and while I may err in my suggestions, yet my earnest desire is to aid in solving this problem.

I believe a closer study of histology and bacteriology, and analyses of blood, saliva and urine, would in many cases be valuable in establishing a more accurate system of diagnosis.

The examination of blood is doubly important, as unless we have something near a normal blood count, we must consider that not only may our life-giving blood stream be absorbing toric matter, but also that our food is not reaching our living cells through a normal medium, and that hence the fundamental factor of life is endangered.

If it is practical to aid nature in combating disease by prescribing a "thorough house cleaning" and "diet" (when one is ill) then why is it not more practical, yes, and more humane to use the same common sense judgment in attempting to prevent disease in the first place? And in so doing ever remember the value of fruit as a purifier and laxative.

Etiology of Pyorrhea.

I believe the deposits of serumal calculi, uric acid and urates, together with the factors set forth in the preceding pages of this article, are the prime causes of pyorrhea. There are two factions in our profession—those who believe that pyorrhea is entirely a local disease, a disease of filth of the oral cavity, and those who believe it is a disease of filth of the intestinal tract, so to speak; or, in other words, an oral manifestation of constitutional disease, helped along by unhealthy, unnatural conditions of the oral cavity; and while the theories are diametrically opposite, yet none of us should be so egotistical as not to respect the sentiments of the other faction.

I have seen cases where it appeared as though the local condition, salivary calculus, was the cause of the pus, yet invariably I found some evidence of serumal calculus, and hence I am not so narrow as to deny that salivary calculus can develop a very filthy mouth, but my experience and observation dictates to my conscience that a genuine pyorrhea alveolaris is influenced by constitutional derangement. Every sufferer from diabetes I ever saw had genuine pyorrhea and we know diabetes is a nutritional disease with urinalysis showing uric acid, urates and excess of sugar due to incomplete utilization of sugar formed in the system.

It requires years to produce a true pyorrhea—whereas but a short period of neglect of oral hygiene will produce a filthy mouth, and hence neglect of oral hygiene should be considered as a cause of true pyorrhea in so far as it predisposes or reduces resistance of oral tissues.

I believe Nature intended our saliva to be our antiseptic mouth wash;

also that the mucous membrane of the mouth should be our fortification against oral infection, and hence the greatest question before us is not "How do germs produce disease?" but, "Why do they not produce disease in all cases, even when their presence is demonstrated?" In other words, if disease was simply left to the bacteria *nations would have been depopulated years ago;* hence the most important factor for health is to fortify our body tissues and secretions against the invasion of bacteria.

The study of nutrition is as important as the study of pathology, as the blood which furnishes nutriment to our tissues comes from our food; hence the better the judgment used as regards our food, the better the nourishment which results. A diet that does not require thorough mastication and of such a hardness, toughness or consistency as to absolutely *demand* it, will if commenced in childhood, result in poorly developed and poorly nourished tissues, and as a result of under stimulation, the glands, muscles of mastication and the teeth will suffer in proportion to non-usage, and the child is liable to have adenoids, thus necessitating the unnatural, unhealthy mouth breathing and hence an irritation to respiratory tract and reduced resistance of lung tissues.

Intestinal stasis, constipation, auto-intoxication and diseases of the oral cavity, knock at the door of every home, but too often little or no attention is paid to this cry of Nature for a *halt,* with the result that sooner or later the body resistance is gone and the person becomes a sufferer from chronic disease, chronic neglect.

These diseases are primarily influenced by a diet rich in protein. The more protein the more putrefaction, and hence more absorption or self-poisoning. Animal proteins are far more apt to produce putrefactions than are *vegetable proteins.* Actual tests of physical endurance and general health show that the average diet is far too rich in protein. Our carbohydrates and fats furnish fuel, which produces *heat* and *energy* for our *living engine* while our proteids represents the material needed to repair our own living engine.

There is no denying that it is unhealthy to swallow food which has mingled with pus or decomposing food particles found between or around the teeth, but that is a condition which, as a rule may readily be checked by proper operative restorative means, through instrumentation and treatment of all tissues involved locally and constitutionally. As true pyorrhea is a slow forming disease, so its cure depends upon the thoroughness of instrumentation, rapidity of elimination, general health of patient and attention given to diet and abuses of Nature. For, remember, that a person with a typical case of pyorrhea is far from being a well person.

Systemic Disease and Mouth Infections.

While there is no denying that constitutional ailments result from focal infection of the oral cavity, yet, inasmuch as we have heretofore given so little attention to that, I would suggest that, although we may be emphatic as to the importance of oral hygiene and good dental service—yet we should not leap from one extreme to the other.

The next few years will be the most important years dentistry has ever experienced; are we prepared for it? Are we prepared to show our patients and the medical profession that we are scientific men and equipped to perform surgical operations in an aseptic manner?

My ideal for real dental service would be a dental sanatorium, where one could have associated with him a staff of professional men, ably qualified to diagnose and properly treat all dental diseases and diseases which might be diagnosed as due to infection from the oral cavity.

Also would I consider the importance of diet, exercise, and in fact all factors which go to make our body tissues strong and healthy.

The old saying, "Keep your feet warm, your head cool, and your bowels open" is truer and *more necessary* to-day then ever, and add to that— "be temperate in all things—abolish fears as to being sick—drink plenty of water—take regular exercise—take hot baths—internal and external, as case requires, and when one does not feel well stop this *everlasting drugging and stuffing.*" Try giving the system a thorough "house cleaning"—inside and out, and thus heed Nature's call for a *halt*—in other words, help Nature to rid us of the overstock of body waste and body poisons. Be fair—play fair, with that most wonderful piece of machinery known, and she, Nature, will return to you the best there is in life—Health—but unless you do play fair you need never expect perfect health.

Some Studies of the Histopathology of Pyorrhea Alveolaris.

By F. Hecker, B.S., D.D.S., A.M., M.D.

Mr. Chairman, Ladies and Gentlemen:

No doubt many of you have asked yourselves the following question: what does the cementum of the root of the tooth, the peridental membrane, and the alveolus look like when affected by pyorrhea alveolaris? There are no doubt present many persons who have observed the cementum, the peridental membrane and the alveolus microscopically and to them this is an old story. But for the benefit of those who have not been so fortunate I am taking the liberty of offering what little knowledge I have collected in nine years, which I hope will be of service to you. When one offers the histopathology of a subject he is not offering any postulate, but is showing microscopical evidence of certain processes which accompany the pathological process under consideration. I have selected from the collection of slides which I possess, certain fields which have been photographed and it is these pictures which will be discussed.

In Fig. 1 we observe that the dental tubuli of the root of the tooth are quite distinct at the lower portion of the picture, but as we pass upward from this point toward the cementum they become less distinct, and at their point of union with the cementum they are obliterated. Further study of the picture shows us that the cementum is not a compact mass but that it is laid down in stratified lamellæ, and that the lamellæ are not uniform in outline nor in thickness. Continuing upward we observe that the point of union between the cementum and the peridental membrane is not smooth but that the surface of it is roughened by fine hair-like projections. It is at this point that the peridental membrane is attached to the cementum. Continuing upward in the picture we observe the peridental membrane lying between the cementum below and the alveolus above. In this picture the peridental membrane is not composed of a uniform regular mass of fibers, but instead we find that in some places they are practically destroyed, and it is in these areas that we find in their stead a homogeneous mass. Further study of the peridental membrane in this picture shows that in its substance there are light areas

which are irregular in shape and in size and they represent areas of degeneration. In other areas we observe that the fibers of the peridental membrane are quite distinct and that in the interfibrillar substance and degenerated areas there are present, round cells which are scattered without any arrangement. Continuing upward we observe that the point of union of the peridental membrane and the alveolus is marked by a heavy

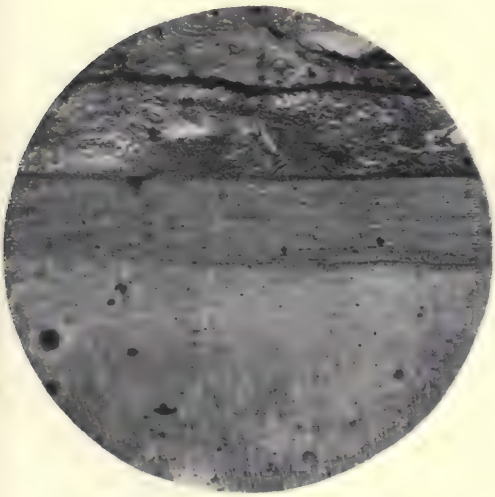


Fig. 1—Magnified 225 diameters.

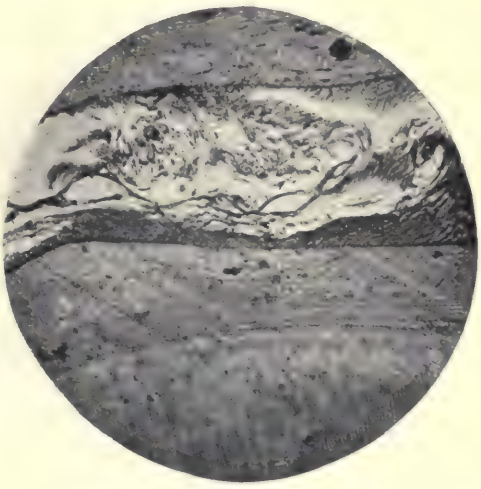


Fig. 2—Magnified 225 diameters.

black line and above this point a small amount of alveolus is shown. At the upper right portion of the picture in the substance of the alveolus there is a light area which is a focus of disease.

In Fig. 2 the dental tubuli of the root of the tooth stand out in bold contrast and as the cementum is approached they become indistinct. The cementum at the left of the picture shows a marked thickening and bulging into the space which in a state of health is occupied by peridental membrane. The point of union of the cementum and the root of the tooth is sharply outlined, as is also the point of union of the cementum with the peridental membrane. The peridental membrane in the picture shows that it is markedly affected by disease and its fibers show a marked degeneration. At the right of the picture the fibers of the peridental membrane are not destroyed in their entirety as observed in the remaining portion of it. In the upper central area of the degenerated peridental membrane a few round cells are present. The point of union of the peridental membrane and the alveolus is not as distinctly marked as ob-

served in Fig. 1 and at the same points its point of union is practically obliterated. The alveolus in this picture shows no disease.

Fig. 3, like the preceding one, shows the dental tubuli very distinctly. The cementum shows a marked hyperplasia, and that it is laid down in distinct lamellæ, and that the basal lamellæ of it is the thickest of any shown. The other lamellæ from within outward are variable in

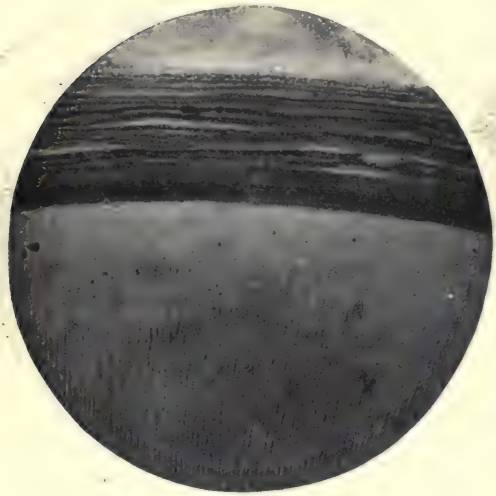


Fig. 3—Magnified 225 diameters.

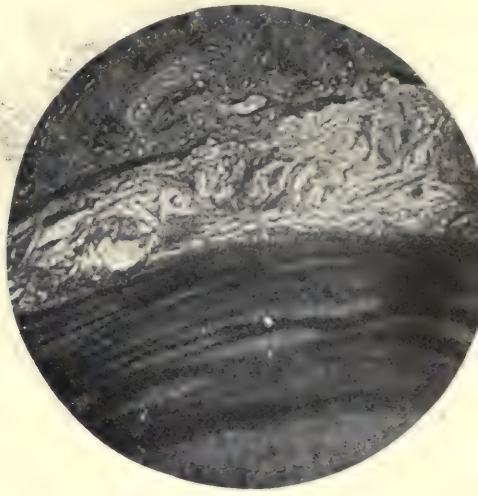


Fig. 4—Magnified 265 diameters.

thickness and are not uniform in their transverse diameters. Between some of the lamellæ of the cementum we observe a space. And further examination of these areas show them to be incompletely developed cementum. At the point at which the cementum unites with the peridental membrane the margin of the cementum is greatly roughened by short fine hair-like projections. These projections have, in this picture, a granular appearance, at their point of union with the cementum. Further study of the peridental membrane in this picture shows that its fibers are disorganized and that granular débris is present in their stead.

Fig. 4 is a higher magnification than Fig. 3, and by this increase of magnification we are better able to study the hyperplasia of the cementum. The roughened area of the cementum with which the peridental membrane unites, shows that the fibers of it dip down into the spaces which lie between the hair-like projections and unite with the cementum. The peridental membrane shown in this picture instead of being composed of fine smooth fibers is composed of fibers which are variable in

thickness, and many of them are distinctly disorganized and in their stead granular débris is present. The point of union of the peridental membrane with the cementum is sharp at the left of the picture while at the center and right portion of the picture their point of union is practically obliterated. At the extreme right of the picture a small area of invasion of the disease into the substance of the alveolus has occurred.

In Fig. 5 we observe a marked hyperplasia of the cementum at the

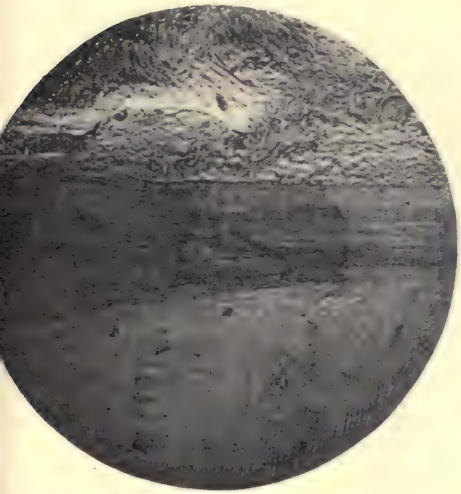


Fig. 5—Magnified 225 diameters.

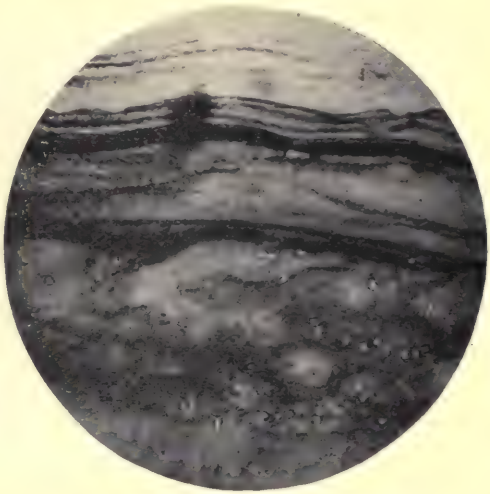


Fig. 6.—Magnified 245 diameters.

left of the picture. Further study of it shows that the cementum is not laid down compactly in lamellæ whose transverse diameter is constant and that the lamellæ are not distinct in their outline because of the compactness of them. The point of union of the peridental membrane and the cementum is sharp in outline; the fibers of the peridental membrane in the upper left of the field are quite distinct, while in the central portion of the picture they show an almost complete degeneration. At the right upper portion of the picture the fibers of the peridental membrane are markedly thickened and show an active process of degeneration. Scattered without any arrangement in the degenerated areas, round cells are observed. The round cells are also found in the interfibrillar spaces of the peridental membrane.

In Fig. 6 we note there is a marked hyperplasia of the cementum compared to the normal thickness of it; and further that the cementum is built up of successive lamellæ. Some of the lamellæ are very compact, while others are loosely constructed and in the substance of this latter

variety there are present large cells which are variable in shape and in size. The margins of these cells are smooth and regular in outline and contain one or two nuclei. These cells are Howship's lacunæ, and the presence of these cells in bone pathologically indicates one of the early stages of destruction of it. Thus finding evidence as clearly presented, as is presented in this picture, we cannot overlook the possible association of these cells with the destruction of the cementum in pyorrhea al-

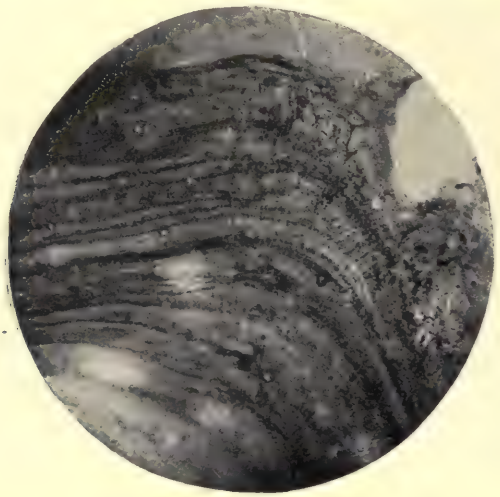


Fig. 7—Magnified 245 diameters.

veolaris. The lamellæ of the cementum which lies nearest the dentine because of its position can, the author believes, be called the basal lamellæ of the cementum. Directly above this lamella there is a very dense compact lamella of cementum which separates it from the basal lamella and from a lamella which lies above it which in its right central area also shows Howship's lacunæ. In the area at the left of the picture this lamella of the cementum is very compact and shows no Howship's lacunæ. Above this lamella there is a thin lamella of the cementum which is very compact and from this point outward no more Howship's lacunæ are observed. The outer lamellæ are variable in thickness and density.

Fig. 7 presents excellently a marked hyperplasia of the cementum and also shows that it is laid down in stratified lamellæ, and that the lamellæ are variable in thickness. In the substance of the cementum there are present fine fibers which run at right angles to the lamellæ. We also learn that the cementum is not constant in its density and that the lamellæ are variable in thickness. In the less compact lamellæ careful examination of the picture shows cemental lacunæ in the left central portion of

the picture. At the right upper part of the picture we note in the substance of the cementum an area which appears to have been destroyed. A more careful study of this area shows that the margins are irregular in outline. In the substance of the immediate adjacent area of the cementum to it some cemental lacunæ are observed which in the picture are shown as light areas. It is likely that in the fresh state this area

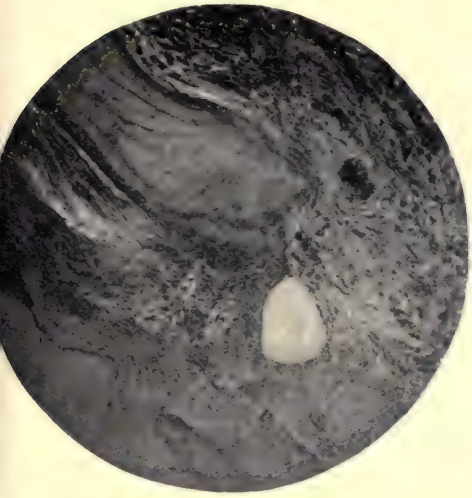


Fig. 8.—Magnified 225 diameters.

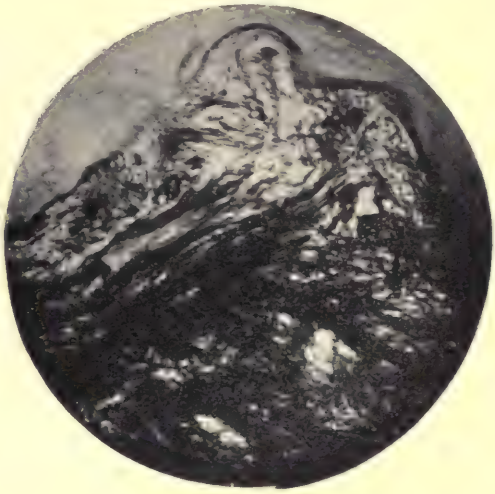


Fig. 9—Magnified 630 diameters.

contained a deposit of tartar and the deposit being inorganic was destroyed in the process of decalcification of the specimen.

Fig. 8 is indeed a very interesting picture and presents a great deal for study. Beginning at the left lower portion of the picture we observe a small amount of dentine and as we pass upward from this point we observe that the continuity of the cementum has been destroyed and that the space which it formerly occupied is now occupied by fibers of the peridental membrane.

Further examination of this area shows in the interfibrillar substance of the peridental membrane many round cells. In the lower right portion of the picture we observe that the fibers of the peridental membrane are scarcely discernible and that in their stead there is a homogeneous mass which stains faintly with the basophylic stain; above and to the left of this area there is an open blood-vessel. A little above and to the left of this blood-vessel there is seen a piece of alveolus projecting into the substance of the peridental membrane. Above and to the right of this piece of the alveolus a marked dark area is shown, which is com-

posed of fibers of the peridental membrane in various stages of destruction. In the extreme upper portion of this area the fibers of the peridental membrane are replaced by round cells. In the lateral portion the fibers of the peridental membrane are variably swollen and very few of them are distinct.

Fig. 9 shows a bundle of the peridental membrane extending out

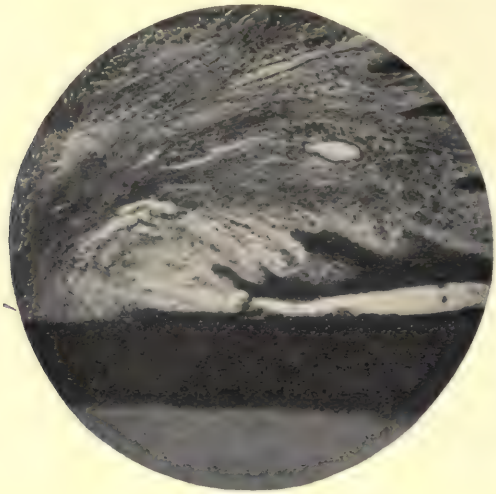


Fig. 10—Magnified 225 diameters.

into the substance of the alveolus. Its fibers are variably swollen and many of them are destroyed. We observe that the fibers of this bundle of the peridental membrane are not uniform, that they do not form a compact mass, but instead that they are distinctly separated in the upper portion of the bundle, and that in this area they are practically destroyed and that in their stead there is fibrinous material. Round cells are scattered in the interfibrillar substance of this area.

In Fig. 10 we note that the root of the tooth and the cementum are not distinctly shown for the reason that at the present we are interested primarily in the peridental membrane. Beginning at the lower portion of the picture the cementum is represented by a broad black line; at the right of the central portion of the picture there is a black area which lies between the root of the tooth and the adjacent area which is covered by epithelial cells of the same variety of which the mucous membrane is composed. At the lower portion of this area there is a homogeneous mass which takes the basiophylic stain. This blackness suggests that this area is nuclear in its origin. Passing upward at the extreme

left of the picture there are present some fibers of the peridental membrane which are approximately normal. In the upper portion of this picture many of the fibers of the peridental membrane are indistinct while others are variably swollen and still others are completely degenerated. Scattered about in the interfibrillar substance of the swollen fibers and in the area of the destroyed fibers there are present many

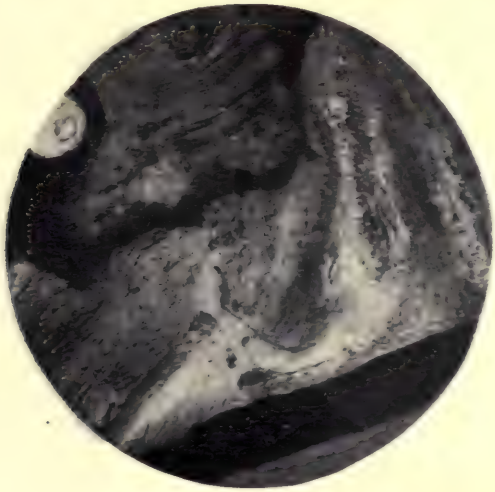


Fig. 11—Magnified 225 diameters.

round cells. At the upper right of the picture one notes three dense black areas projecting into the underlying tissue. These areas examined microscopically are seen to be composed of epithelium.

Fig. 11 is a picture from a deeper area of the tissues from the same specimen as Fig. 10. In this picture we see many fibers of the peridental membrane are approximately in a normal state of health. Others which are in proximity to the cementum are variably degenerated. At the upper right portion of the picture the peridental membrane is markedly affected and in this area it practically is occupied by round cells, while the peripheral area of the picture shows only a few of them. The point of union of the peridental membrane and the alveolus is marked by a broad black irregular line which is smooth in its outline. The alveolus in this picture shows no foci of disease.

Advancing a little deeper into the tissues (Fig. 12) it is noted that the peridental membrane is markedly affected by the disease, many of its fibers and especially those which unite with the cementum are swollen while others are, at the point of union with cementum, practically ob-

literated. On further examination we observe that there is a distinct space between the bundles of the peridental membrane. In one of these spaces located in the center of the field at its lower portion there are a few remaining fibers of the peridental membrane and granular débris, while in the upper portion round-cells are present. Another area much larger than this one is located in the right portion of the picture. In this area

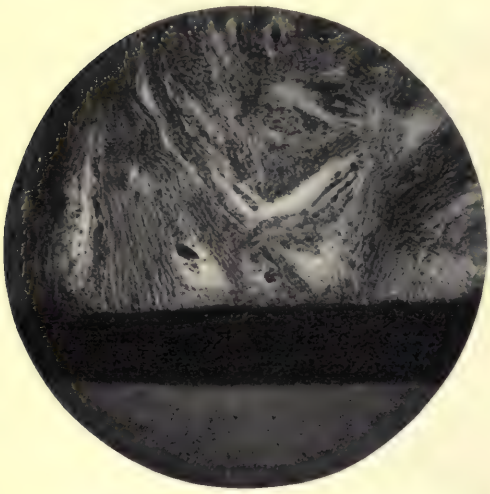


Fig. 12.—Magnified 225 diameters.

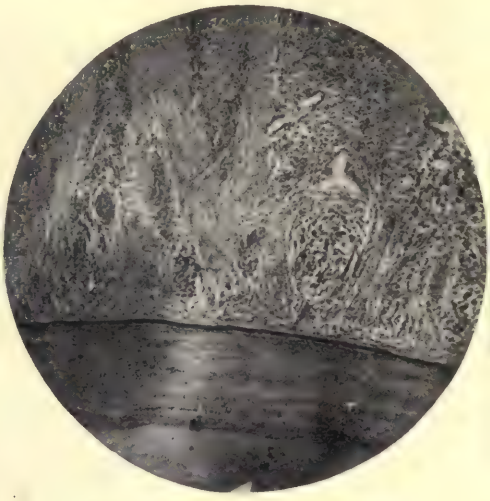


Fig. 13—Magnified 225 diameters.

as in the former there are a few fibers of the peridental membrane and round cells. The material contained in these areas takes the basophylic stein. From this observation one is led to infer that the stained material is nuclear in its origin. Advancing upward we observe that the round cells are increasing in number and that in the upper portion of the picture a large clump of them is present, and that the area lying to the right of this clump of round cells is completely disorganized.

Beginning at the lower portion of Fig. 13 we note the root of the tooth and the cementum. The cementum shows no hyperplasia although it is somewhat thicker in its transverse diameter than the normal thickness of cementum. The point of union of the cementum and the peridental membrane is sharply outlined. In the right lateral area of the picture one observes that the peridental membrane is completely destroyed and that in its stead there is a homogeneous mass in which there are many round cells. At the left of this area one observes a bundle of peridental membrane which is incompletely destroyed and lying to the left of this bundle we observe a round area which is composed of round

cells and homogeneous débris. Above this area we note that no fibers of the peridental membrane are present and that the space which was formerly occupied by them is now occupied in its entirety by round cells. In the lower central area and in the left central portion of the picture there are shown small active foci of disease in the substance of the peridental membrane. Thus from this picture we learn that there are a few

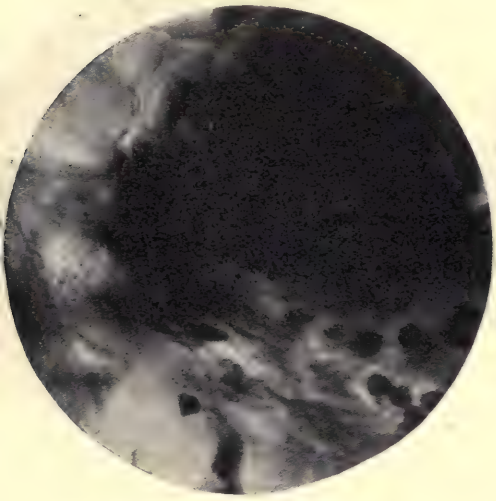


Fig. 14—Magnified 1,000 diameters.

Fig. 15—Magnified 145 diameters

bundles of the peridental membrane intact and that the space which was occupied by them in health is now occupied by round cells.

Fig. 14 is a high power picture which shows that the content of one of the degenerated areas of the peridental membrane is composed of fibrinous material in the meshes of which there is present a granular and homogeneous débris and round cells.

Fig. 15 is a low power picture and shows the root of the tooth, the cementum, peridental membrane and the alveolus. Commencing at the root of the tooth and passing upward we observe that the cementum is practically intact, but the peridental membrane at the lower left portion of the picture is completely destroyed while at the upper portion of the picture there are light areas in the substance of the peridental membrane which are foci of disease. Continuing upward and outward from the peridental membrane one notes the alveolar process which in its substance shows in its central portion a large area which has been diseased but at the time of obtaining the specimen was undergoing a process of repair which is shown by the fine net work of blood-vessels contained in

its substance. Continuing outward we observe at the lateral portions of this picture two active foci of disease.

The right lower portion of Fig. 16 shows a small amount of alveolar process. And the left lateral area shows a group of blood-vessels. A careful examination of the walls of the blood-vessels shows a perivascular round celled infiltration of them. The remaining portion of this photo-

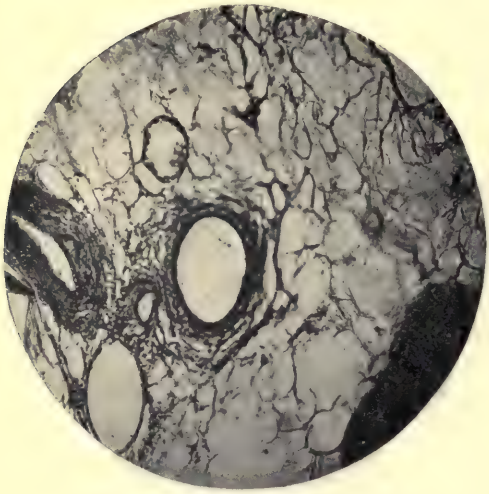


Fig. 16—Magnified 400 diameters.

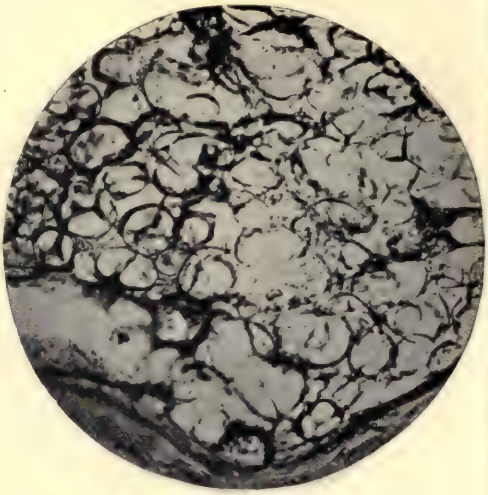


Fig. 17—Magnified 400 diameters.

graph shows a fatty degeneration and round cells in the intercellular cement substance of the fat cells.

In Fig. 17 we observe at its lower margin a small amount of alveolus and that the remaining portion of it shows a fatty degeneration. In the upper left margin of the field a small clump of dense black material is observed; this mass when focused upward and downward is found to be composed of round cells.

Fig. 18 is a moderately high power picture taken from an area in the alveolus. In the central portion of the picture we note fat cells surrounded by a fine fibrino-granular débris. In the meshes of this débris many round cells are lying at the margins of the fat cells.

At the lower portion of Fig. 19 there is shown a small amount of cementum and the point of union of the cementum with the alveolus is distinctly shown. The cementum shown in this picture is quite evenly laid down. In the right central area of the peridental membrane a large area of degeneration is observed which is irregular in shape. A little below this area and to the left there is another area of degeneration.

The fibers of the peridental membrane in the near proximity of these areas are in various stages of degeneration. At the right of the central portion of the picture one observes a thin plate of alveolus with which the peridental membrane unites; above this thin plate of alveolus there is a cavity. At the extreme right of the cavity there is a dense black area which on close examination microscopically is found to be com-

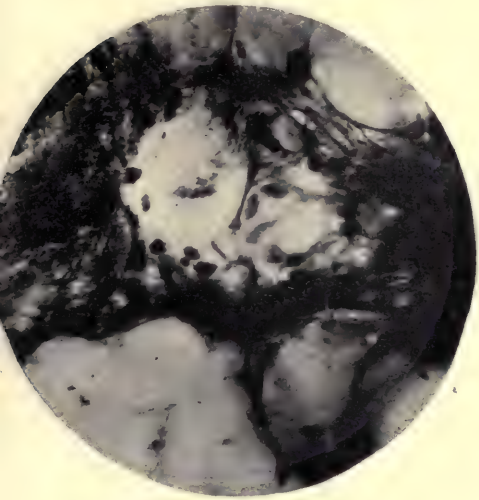


Fig. 18—Magnified 600 diameters.

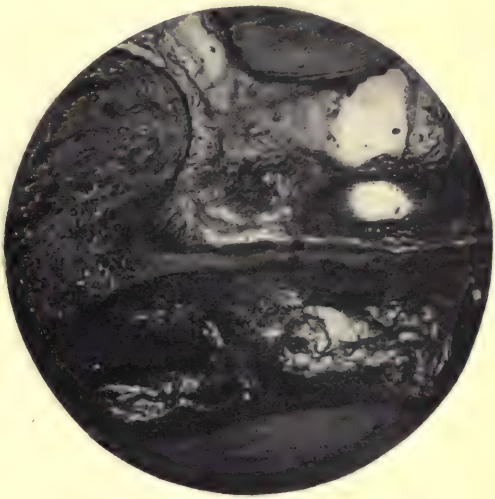


Fig. 19.—Magnified 225 diameters.

posed of a homogeneous material and some round cells. Above and to the left of this point two light areas are noted and to the left of them some fibrinous material and a few round cells are present. Lying above the upper light areas and the fibrinous material to their left we note the lower portion of a tongue-shaped projection of the alveolus.

Fig. 20 is taken from a deeper area and from the same as Fig. 19. In this picture we note that at its extreme lower part, a small portion of the narrow plate of the alveolus noted in Fig. 19, and that the cavity which lies above this point is now pretty well outlined on either side of the tongue-shaped projection of the alveolus. On either side of it a variable amount of fatty degeneration is present, and in the intercellular cement substance of the fat cells a few round cells are observed. Continuing further into the substance of the alveolus we note Fig. 21.

On either side of the tongue-shaped piece of the alveolus, a fatty degeneration and further that round cells are present in the intercellular cement substance. At the extreme upper portion of the cavity on either side of the alveolus there are foci of disease.

The lower portion of Fig. 22 shows a small amount of the cementum. At the upper edge of it there is present a very dense black line which marks the point at which the cementum unites with the peridental membrane. In the lower central portion of the picture we observe a light oblong area which is bounded below by the cementum and above and laterally by the peridental membrane. Further study of this picture

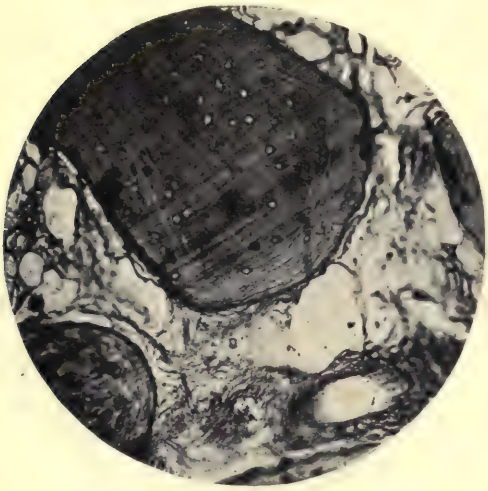


Fig. 20—Magnified 225 diameters.

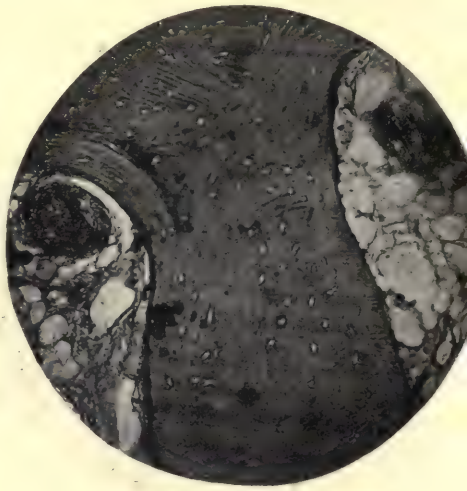


Fig. 21—Magnified 225 diameters.

at this point shows that lying directly above this area there is seen an active focus of disease of the peridental membrane and that it is composed of round cells and fine granular débris. Continuing upward in the central portion of the picture the fibers of the peridental membrane are quite distinct but as they approach the central area they become quite indistinct and they are soon completely obliterated by the disease. Continuing upward from this point we note the presence of a canal which is bounded on either side by the alveolus. The lateral walls of the canal show a few indistinct fibers of the peridental membrane. The central portion of this canal shows indistinctly the remains of some fat cells. Continuing upward we observe that this canal communicates with an area of disease in the deeper portion of the alveolus.

The deepest portion of the canal (Fig. 23) shows that the walls of it are heavier than noted in Fig. 22, and that instead of the wall of the canal being covered with a few fibers of the peridental membrane it is now covered with a dense compact mass of a fine granular débris. In the substance of the cavity of disease in the alveolus with which this

canal communicates we note a mixture of fine and coarse granular débris in the left lower and central areas, while in the upper portion coarse débris is present. In the right lower and lateral areas of it there is present a dense homogeneous material.

Conclusions. From the foregoing photomicrographs we learn that the pathological changes which accompany pyorrhea alveolaris are not confined to any one of the

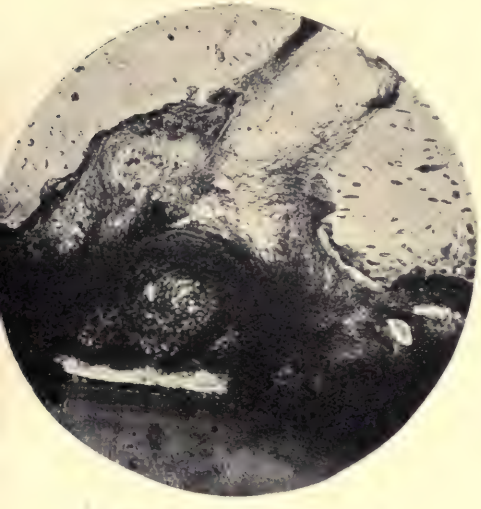


Fig. 22—Magnified 225 diameters.

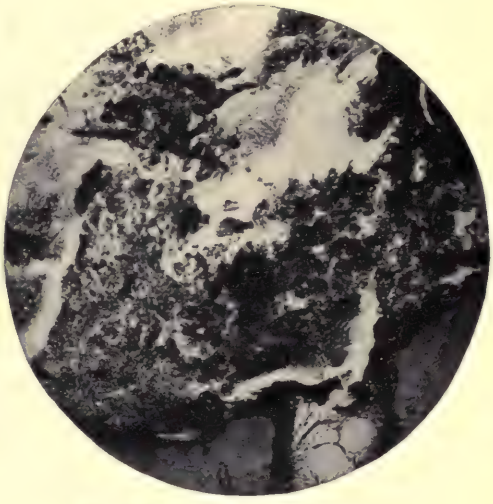


Fig. 23—Magnified 225 diameters.

tissues associated with the root of the tooth and on which the tooth is dependent for its normal position and relation to its neighbor and also its occlusion, but that all of the tissues are affected to a greater or lesser degree.

We learn in the study of the cementum that it is not laid down in a uniform compact mass, but that it is laid down in lamellæ on the root of the tooth. We further learn that the lamellæ of the cementum are not uniform in their transverse diameter nor in their density. It is also shown that the basal lamellæ of the cementum is thicker than any of the other lamellæ superimposed on this layer, and that in this layer there may or may not be Howship's lacunæ. In one of the pictures we learned that there are present fine lines which run at right angles to the substance of the cementum. It is also shown that an over-development of the cementum does occur in a local area. This overgrowth when present is a hypercementosis, or hyperplasia of the cementum. We also learn that the surface of the cementum which unites with the peridental membrane

is not smooth, but that it is rough, and that the roughness of it is composed of fine hair-like projections, which at their point of union with the cementum are granular in appearance.

Continuing our studies we learn that the peridental membrane shows a process of disease which which may commence as a small focus in which the fibers become swollen in appearance, and that this stage is followed soon after by a process of disintegration of their substance which later is followed by complete destruction of their continuity in mass in the area affected by the disease, and they thus undergo a process of liquefaction. Following closely in the course of the disease the whole mass is sloughed away, and if the surrounding tissue possesses sufficient vital force there soon begins a second process, namely, that of regeneration, in which Nature endeavors to take care of the affected tissue by replacement of it with new tissue. The affected areas are not uniform in their outline nor in their size. We also learn that the peridental membrane when affected by disease is destroyed in its entirety, but that local areas are at first attacked and that with the continuance of the disease other areas become affected. Thus we learn that the disease invades areas adjacent to the diseased one by continuity of tissue. We further learn that the peridental membrane is richly supplied with blood-vessels. From several of the pictures we learn that the peridental membrane will invade the alveolus for a considerable distance from the root of the tooth. In one picture of a series of three we are able to explain why the peridental membrane does not unite with the root of the tooth because of the fact that the epithelium of the mucous membrane covers the free ends of the fibers of the peridental membrane, and by this process the cavity commonly called the pocket is lined with epithelium of the same character as covers the other parts of the mouth.

On further study we learn that the alveolus when affected by disease undergoes a variety of pathological changes. In some of the pictures it is shown that the area affected by the disease undergoes a granular degeneration; in others, a fibrinous degeneration; while in others it undergoes a fatty degeneration. Further study of the alveolus shows that it is richly supplied with blood-vessels and that the vessels show a marked perivascular infiltration of round cells, and that in the intercellular cement substance of the fat cells round cells are noted. In the substance of the alveolus we observe one area in which there is present an area of regeneration of it characterized by the presence of fine regenerating blood-vessels. This observation is in itself *prima facie* evidence of a process of regeneration, and from this evidence one can infer that the alveolus when affected by the disease is capable of regeneration.

The Relation of the Endamoeba Buccalis to Pyorrhea Alveolaris.

By Harold I. Horner, D.D.S., Richmond, Cal.

In July, 1914, Drs. M. T. Barrett and Allen J. Smith, of the University of Pennsylvania, announced their belief that the endamœba buccalis was a causative factor in pyorrhea alveolaris. This statement was based on the examination of 46 cases, in all of which motile endamœbæ were found. In September of the same year Drs. Bass and Johns, of Tulane Medical College, New Orleans, reported 86 cases of unmistakable pyorrhea, in all of which the endamœbæ were found. Again in February, Bass and Johns reported over 300 cases in which the endamœbæ were present. Evans and Middleton, in January, 1915, announced the examination of 72 cases in 70 of which the endamœbæ were demonstrated, 54 of these cases being complicated with systemic disorders. These men believed the endamœbæ to be a causative factor in pyorrhea, because of their almost unvarying presence in the pyorrhea pocket, and their prompt disappearance and the healing of the pocket upon injection of a known amœbacide.

These statements, coming from men of such acknowledged reputation, aroused considerable discussion and a great interest among the members of the medical and dental profession. A great many practitioners rushed into the treatment of pyorrhea with emetin hydrochloride without familiarizing themselves with the subject. It was given internally in the form of alcresta ipecac; intramuscularly, and by a very few, intravenously. All this without any particular knowledge of the drug they were using and with the expectation of a positive result. These men were disappointed, consequently they discarded it and condemned it as another failure in the cure of pyorrhea. Some men continued the treatment cautiously, watched for symptoms and awaited results. An improvement was a ray of hope to be followed by more thorough study and investigation and better technic. These men secured appreciable results as their skill increased and their technic became more exact. Some other students of the subject saw the improvement, but were not ready to accept emetin hydrochloride as a specific remedy for pyorrhea alveolaris.

Symptoms of Pyorrhea Alveolaris.

In order that we may better understand the following, let us first obtain a minute description of the symptoms of pyorrhea. Ordinarily we hear a case diagnosed as pyorrhea alveolaris when the soft tissues have withdrawn from around the necks and roots of the teeth, when deep pockets are found surrounding the roots of the teeth, the peridental membrane partially destroyed, the teeth loose and a copious discharge of pus at the margin of the gums. This is pyorrhea, undoubtedly, but pyorrhea in a very advanced stage. This disease runs a course of from five to twenty years, the initial lesion appearing as a slight injury to the peridental membrane, which may bleed slightly on brushing, and in which pus may be demonstrated microscopically, it is true, but that is typical of the initial lesion. This is usually considered as unimportant, an astringent dentifrice is prescribed and the matter forgotten. Now this open wound is a favorable lodging place for the pyogenic organisms which habitually infest the mouth, the staphylococcus, streptococcus, bacillus, diplococcus, and numerous other organisms. Protected as it is, it forms a favorable harbor in which the organisms multiply. If endamœbæ be present in an individual's mouth (and they are easily transmitted from an infected individual to one who is not infected), we have everything favorable for the development of this lesion and a final destruction of the peridental membrane and the loss of the tooth.

Endamoeba Buccalis.

Now let us study the endamœba buccalis, which seems to be the specific organism on which the progress of this disease depends. It is not our intention to enter into a morphologic description of the endamœba buccalis nor the methods of identifying this protozoa. For a concise account of this I would refer you to the article of Dr. Thomas Le Clear, published in the ITEMS OF INTEREST June, 1915. We will, however, take up the habits of the protozoa, for they bear directly upon the causative effect in pyorrhea alveolaris. The amœbæ will be found most prolific in the inflamed peridental membrane at the bottom of the pus pocket. Some may be found in the pus in the pocket, but their habitat is in the inflamed and necrotic tissue. They move about in this area by thrusting out a pseudopodia composed mostly of ectosarc into the surrounding membrane into which the endosarc, the plasma of the cell flows. Under microscopic examination they present an impressive picture as they force their way between the cells, crowding through spaces seemingly impassible. They feed upon a round nucleated cell which is found only in inflamed and necrotic areas. These cells have not been

sufficiently studied to make a classification possible, but often they are found within the endamœba.

Now picture with me these endamœbæ passing back and forth through the inflamed area, out into the pus pocket to be bathed with pyogenic organisms and then again into the tissue in search of food. Apparently the amœba has power of holding to itself pyogenic organisms with which it is covered each time it penetrates the pus area. Under the microscope the amœbæ may be seen entering the tissue with several of these pyogenic organisms attached to it, and as it passes through the interstices of the cells, actually scraping off and depositing them in the inflamed area, where they go and result in suppuration and catabolism. In this manner the process continues, the pyogenic organisms which have no power of penetration are being constantly carried and implanted in the tissues by the amœbæ, until we have the clinical picture presented which we recognize as pyorrhea.

It has been stated that the amœbæ live on these pyogenic organisms. This, however, would seem to be inaccurate, for while we occasionally find an endamœba enclosing a pyogenic organism, the cases are very few compared to the number that do not. These protozoa secure their food by enclosing it. Considering this fact it is not surprising that they should thus incorporate some pyogenic organisms. Furthermore the endamœba in a normal saline solution, where the pyogenic organisms are abundant, will live about one hour.

Bass and Johns recently reported on 500 cases examined, in only two of which the endamœbæ were not found, and concluded that in these two cases they were probably present but were not found because of imperfect technique. It is highly probable that the difference in reports by competent bacteriologists has been due to the fact that pus in many cases has been examined and reported on instead of the tissue at the bottom of the lesion. When proper technique is employed and the specimen to be examined is taken from the deep lesion, endamœba buccalis is always present.

The prevalence of the endamœba buccalis in healthy subjects is readily accounted for by our methods of living. Most adults have pyorrhea in some stage. We think nothing of drinking after members of our own family. What mother having pyorrhea will hesitate to kiss her child because of it? You are familiar with cases of husband transmitting pyorrhea to wife, and vice versa. These are only a few of the methods in which the organism is transmitted from the infected to the healthy subject. The experiments of Dr. Anna Williams call particular attention to the fact that the endamœbæ was demonstrated in the mouths of many

unquestionably healthy children. Yet those same children had undoubtedly been exposed many times in the preceding twenty-four hours to the infection.

Administration of Emetin.

We have at hand an efficient amœbæcide, emetin hydrochloride. We know where the amœbæ are situated in the lesion. The next task is to get the remedy to the organism. The area is not well supplied with blood; necrotic tissue never is. It is not sufficient to remove them from the pus pockets by irrigating with an emetin solution. The tissue must be infiltrated. Each living amœbæ must be reached and destroyed.

Col. Leonard Rogers, of the Indiana Medical Service found emetin to be an amœbæcide in dilutions of 1 to 100,000, and to be eliminated from the blood stream in about twenty-four hours, the maximum concentration reached in about fifteen hours .The drug has been administered in as large doses as two grains in amœbic dysentery without any untoward effects.

The most efficient method of treatment consists in first thoroughly cleansing the infected area, followed by an infiltration of the diseased tissues with a one-half per cent. solution of emetin hydrochloride. For this purpose use a high-power hypodermic syringe, such as is used in dental operations, and inject much the same as for local anesthesia. On the same day an intramuscular injection of one-third grain of emetin hydrochloride is given, care being taken to inject deep into the muscle tissues. A superficial injection will result in a severe irritation. For those who will familiarize themselves with the technique, the intravenous injection of one-half grain is more efficacious and less unpleasant to the patient. These injections, either intramuscular or intravenous, are continued for a period of six consecutive days, once every twenty-four hours. Some very severe cases may require as many as ten days or even two weeks. The clinical aspect will be sufficient guide, however. The local infiltration of the tissues is used as an aid to the other injections and the frequency of their use will depend upon the clinical aspect of the case. Particularly persistent pockets should be infiltrated locally. Some patients show an idiosyncrasy to this drug, but this soon passes if treatment is discontinued for a day or two. Alcresta ipecac fills a demand for a remedy which does not require the use of the hypodermic. This is the least efficient method of all. The patient reports every day for the hypodermic, and in this way the case may be watched more closely. I shall not burden you with a number of case histories. Two I have selected as typical of the cases presented.

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Case Histories. Case I.

Mr. J. L. presented upon recommendation of his physician on March 22, 1915. Advanced pyorrhea, pus discharging from around the roots of all the teeth and much destruction of the peridental membrane.

The teeth were all loose in their sockets.

Temperature 103.5, general feeling of malaise, severe pain in chest wall involvement of nearly all the articulations of the body.

Alcresta ipecac was prescribed, the infected area thoroughly cleansed and infiltrated with one-half per cent. solution of emetin hydrochloride for eight successive days. The first day the left side of the mouth and on the successive day the right side of the mouth was infiltrated. On the ninth day the pus discharge had entirely ceased and the patient received one-third grain of emetin intramuscularly. He reports once a month for examination.

He has no further symptoms of arthritis and is not troubled with the errant pains with which he previously suffered. During his illness he suffered from intestinal fermentation, expelling large quantities of gas. He gave a history of this trouble as being of prolonged duration. This condition seemed to have been entirely eradicated by the cure of the pyorrhea condition.

Case II.

Mr. M. P., age 45 years, presented January 30, 1913, with a pus discharge from the gingivæ, deep pockets around the upper molars and the second bicuspids. The remaining teeth were less involved, but their sockets were discharging pus. He complained of considerable neuralgia. The patient was given thorough surgical treatment and instructed in prophylaxis. He was dicharged and directed to report in three months. The discharge had ceased from all the pockets except the first molar and was much less in that locality. The patient did not present again until March 17, 1915 His condition was much worse than on his first visit to me, especially around the region of the molars; the neuralgia was so severe as to interfere with his work. He was treated according to above-mentioned methods, and on June 7, 1915, the discharge had entirely disappeared, but there was no reattachment of the peridental membrane around the molars. These pockets were obliterated by removing the soft tissues and bone to the level of the floor of the pocket. At the present time the teeth are all tight in the process and the surrounding soft tissues are in a healthy condition.*

*On receipt of proof of the above, July 7, 1916, I called this patient to the office for examination. I found his mouth apparently healthy; no pus disclosed even upon microscopic examination. A slide however reveals amœbæ. This smear was taken from around the lower incisors. I could find no amœbæ in the smear from around the molar about which I had obliterated the pocket surgically. See Supra.—H. I. H.

Clinical Aspects of Cases Treated with Emetin.

Now conceding the endamœba buccalis to be the specific organism of pyorrhea, and that its destruction brings about the disappearance of pus from these lesions and the regaining of the normal tone of the tissues, what is the clinical picture presented in these advanced cases of pyorrhea which have been treated with emetin? The peridental membrane is destroyed to the bottom of the deep pocket around the root of the tooth and the dead alveolar process is slowly absorbing. The tissues at the bottom of the pocket may be healthy, but we still have the pocket in which food débris may lodge, making a suitable place in which the many pyogenic organisms of the mouth will again flourish. Scientific investigation has pointed out the organism which is responsible for this destruction, and given us a specific method of destroying it. But the task of obliterating these pockets is entirely in the hands of the dentist.

To properly understand the conditions with which we must cope it is necessary first to review some of the pathology and histology of the tissues involved, namely, the cementum of the tooth; the peridental membrane surrounding it; and the alveolar process which gives it support. I wish first to impress upon you the fact that the alveolar process is dependent on the tooth, and also that the tooth is dependent on the alveolar process for its permanency in position. The alveolar process exists only for the purpose of holding the tooth in place, and disappears when the tooth is removed. It is formed about the teeth as the teeth are forced into their positions, and if the teeth are irregular in their position the alveolar process will be irregular. If we move the teeth in orthodontia the process is removed and reformed about the teeth. This co-relation becomes an important matter then when we attempt to study their pathology.

The cementum has no power of repair within itself. Bones have power of repair within themselves because they are supplied with circulation, erythrocytes and lymphatics. The cementum has none of these. When there has been an injury to the cementum the repair is made by the deposition of more cementum by the peridental membrane. If the peridental membrane is diseased there can be no repair.

Peridental Membrane.

The peridental membrane, which is the tissue primarily involved in pyorrhea, is composed of fibrous connective tissue. This tissue is very resistant to suppuration, but when once destroyed by suppuration will never regenerate. Dr. G. V. Black says: "A very severe inflammation, a very great loss of tissue by calcic inflammation

may be overcome very well; we may still have those teeth put in service for many years; while if you have a similar loss from pus pockets, from phagedenic pericementitis, you may just as well extract the teeth at once."

In these cases of chronic pyorrhea we have the cementum bared half or two-thirds the length of the root; the corresponding peridental membrane destroyed and the supporting alveolar process absorbed, not to the depth of the pocket, but nearly so, for the absorption of the process is slower and follows after the destruction of the peridental membrane. This leaves the tooth much weakened, loose and surrounded by a pocket for the reception of food débris and an ideal place for a reinfection.

The fact that regeneration of fibrous connective tissues is not known to take place in any part of the body would lead to the conclusion that the peridental membrane once destroyed by infection would not regenerate. If this tissue will not regenerate we can get no attachment to the denuded cementum. The investigations of T. Sidney Smith, of Palo Alto, however, point to the possibility that it may be regenerated in favorable cases. In these cases the pockets have been filled with a tissue which seems to be a true peridental membrane. However, surgical interference causes cicatricial tissue to form, the very nature of which would cause it to surround the tooth tightly and to simulate very closely a reattachment to the cementum. The procedure necessary to get this reattachment is very delicate and demands a skill which very few men have been able to acquire. An absorption of the alveolar process has taken place and this in itself has removed the main support of the tooth. Again we have the question of regeneration of the alveolar process which has been removed by Nature. The peridental membrane, which is to the alveolus what the periosteum is to bone, has been destroyed. Consequently, unless we can get a regeneration of a true peridental membrane we can have no hope either for reattachment to the denuded cementum or regeneration of the lost alveolus. The approximal gum septums and the gingivæ have been destroyed, and these cases will present at best empty approximal spaces, the necks and portions of the roots of the teeth denuded and with only partially filled pockets.

Dr. Riggs advised cutting away these tissues to the bottom of the pockets. Certainly we cannot allow these pockets to remain. If the peridental membrane will not regenerate we must close up these pockets with cicatricial tissue; failing in this, the only alternative will be to obliterate them by cutting away the tissues to the bottom of the pockets.

But these cases to which I have referred are the old chronic cases and by far the smaller number. The symptoms of early pyorrhea may be

readily recognized and steps taken to prevent the invasion of these specific organisms into the peridental membrane and its destruction.

I have very carefully called attention in the earlier part of this paper to the symptoms of pyorrhea in its earlier stages: inflamed and bleeding gingivæ, very minute pockets in the peridental membrane and a slight flow of pus. These symptoms should serve as a warning and immediate steps be taken to remedy them. With an efficient amœbæcide and correct surgical interference these lesions may be healed and the pockets closed. Then proper instructions to the patient regarding prophylaxis should prevent their recurrence.

The trend of dentistry of the present day is toward prophylaxis of the hard and soft tissues of the mouth. Let us supplement this prophylaxis with an amœbæcide whenever the primary lesions of pyorrhea are present. And let us learn to recognize these lesions. When you examine a mouth look first at the soft tissues and ascertain their condition.

This then is the theory of the relation of the endamœba buccalis to pyorrhea alveolaris. A theory it must remain until the satisfying of Koch's postulates has placed it in the realm of facts. But a sound working theory, nevertheless. I must point out to you here that the actual satisfying of Koch's postulates may come late.

The malaria plasmodia was recognized as the specific organism of malaria several years ago and the specific quinine employed whenever the organism was demonstrated in the blood. Yet it was only recently that Koch's postulates were satisfied in regard to the malaria plasmodia.

Clinical tests and scientific facts all bear evidence so strongly in support of the theory that the endamœba buccalis is the responsible organism in these cases that we, to whom the laity look for relief, cannot ignore them. Let us not make the mistake that our brothers of the medical profession made with diphtheritic antitoxin. This remedy when it was first offered to the medical profession was severely criticised. Some of the greatest authorities in medicine refused to accept it. The zeal of a few men who believed continued to increase the evidence in favor of its use, until to-day no practitioner of medicine will attempt the treatment of diphtheria without calling to his aid the diphtheritic antitoxin.

We of the dental profession refused to believe Horace Wells when he first demonstrated the anesthetic properties of nitrous oxide, and to the medical profession years after was left the task of developing one of the greatest gifts to humanity, anesthesia.

Are we going to blunder again and close our eyes to facts, or will

we investigate these facts, experiment and study them until we determine whether or not the amœba buccalis is a determining factor in pyorrhea?

Gentlemen, I urge you to add to what information I have been able to give you by study, clinical research and discussion until the truth has been proven so conclusively that we will all agree and say:

"The amœba buccalis is or is not a causative factor in pyorrhea alveolaris."

The Conservation of the Alveolar Process with Special Reference to Pyorrhea Alveolaris, Oral Sepsis and the General Health.

By M. H. Cazier, M.D., New York City.

Searching the annals of medical history we find that the subject of oral sepsis has never received adequate attention, but the signs are changing, actuated by the utterance of Dr. Wm. Hunter, of London, in 1910—a reform has started and is bearing fruit. The researches of able students has led the thought of the world to the conclusion that the secret of longevity is locked up in the mouth, and that the dentist should have the combination, a responsibility which imposes an obligation; and if the human race is to be emancipated from the destroying factor which menaces the lives of a large majority of adults before the age of fifty, there must be a friendly and sincere co-operation and a sharing of responsibility between dentists and physicians for the accomplishment of this great undertaking. Physicians must learn that it is a crime to sacrifice firm teeth to break up the focus of infection, and dentists must learn that though infection is a source of great danger, yet as a casual factor in mouth lesions it is of but secondary importance.

When we use the phrase "blood poisoning," the average mind pictures a patient smitten with a fatal malady, cut off suddenly; or if death is averted it is at the hazard of the loss of limb or other structure. It does not occur to the average individual, either in the profession or out of it, that there are all *grades* of difference in the degree of poisoning. Taking a case where the streptococcus viridans invades the system through the blood stream in overwhelming numbers, producing the most acute and dangerous manifestation, we have a mental picture common to all. But it should be made very definitely clear that between this very typical and dangerous infection and the slightest form of suppurative disease there are all grades of differences, and if we shall say that the infection which causes death within twenty-four hours is a hundred per cent. toxic, then there are the cases that are ninety per cent., eighty per cent., fifty per cent., and a very large number which are only ten and twenty-five per cent. toxic.

By this we mean to say that a large percentage of the human family who reach forty are undergoing a process of systematic infection because of chronic suppurative conditions which are going on in some portion of the body. It is frequently to be located in the falopian tube in the female, in the vessicula seminalæ and the prostate of the male, and of course the focus may be located in almost any portion of the economy, including the tonsils, the middle ear, frontal sinus, ethmoid cells, etc. But by far the most common, and withal the most destructive to human life and health is that form of ulcerative change which occurs in the mouth, involving the bony support of the teeth as well as the connective tissue and the gums. This is known as pyorrhea alveolaris. Its onset is insidious. It is not inflammatory, but degenerative in the beginning, and therefore produces no pain nor physical disturbance. Therefore, it usually gains considerable headway before its presence is discovered. Its influence on the general health is made manifest most prominently after the second or third stage is reached, when the teeth become tender and loose for want of support, when mastication is difficult and imperfect, and when there are corresponding defects in digestion and assimilation. These defects and their direct consequences are sufficient to reduce the vital energy anywhere from ten to fifty per cent., and with this as a matter of course we have a corresponding decrease in efficiency and the ability of the individual to enjoy the normal experience of life.

But this is not all; if the destructive ulceration of these tissues continues, *multiple infection results,* and entrance into the blood stream is *exceedingly common,* the author believes, and the belief is shared by men of *large* experience, that a great proportion of the human family are infected in this manner, and from the dawn of human history this necrotic suppurative change has been going on, shortening lives, minimizing strength and dissipating the joy which should attend; and in most cases of neuritis, arthritis and other infections, this ulcerative absorption of the alveolar process is an *accessory before the fact;* and in summing up the total of human sacrifice, if war and famine have slain their thousands, then pyorrhea alveolaris has slain its *tens* of *thousands.* Notwithstanding the horrors and failures which have attended this disease in the past, the author believes and proves in this paper that the true pathology has never before been taught, and that when correctly understood a plan of treatment is clearly indicated, following which the treatment of the disease is removed from the domain of empyricism and placed upon a rational and scientific basis. When these facts shall receive proper recognition, the average term of human life will be materially extended, and what is even more important, the period of efficiency and enjoyment will be immeasurably protracted.

Visible Phenomena of Pyorrhea.

There are certain phenomena connected with the disease, pyorrhea, which attracts the attention on occular inspection, and this single method of study is too commonly the only one pursued by the dentist. Firstly, there are the bluish, purple gums; then there is the appearance of pus welling up about the teeth, evidencing infection, and this implies a lesion. Then we discover lime deposits on the teeth. This occurs above the gum line as the result of the precipitation of the salivary salts and is of a whitish appearance. Then later on, deeper in the lesion and attached to the tooth, is found a deposit of a brownish color, extending as far as the destruction of the bone has occurred. This brownish deposit has received the name "serumal," on the assumption that it is deposited out of the serum of the blood, an assumption entirely theoretical and without the slightest foundation in demonstrable fact.

The author has conducted a large number of studies on the cadaver, which tend to prove that the so-called serumal deposit is the direct *result* of the destruction of the alveolar process, the bony support of the tooth, and is directly derived and made up from the lime portions of the bone which undergoes molecular death and destruction. This the author contends is a fact of *supreme* importance, because it indicates a line of treatment which is *basic,* for if the brown deposit is the result of the destruction of the bony support, *then it cannot be its cause,* and by preventing the destruction we prevent the deposit, and the writer desires to make plain his position and charge the dental profession with having made the mistake of transposing in this particular instance the cause and the effect.

Etiology of Bone Destruction.

This leads us to an inquiry concerning the cause of the destruction of the bone, which is due beyond doubt to the inadequate nutrition of the part; inadequate because of defective end organ structures. For generations the dental profession has had strict notice. All students of anatomy and physiology are familiar with what the text writers have been pointing out, that the alveolar process is a transitory structure; that it undergoes atrophic changes, beginning about middle life and proceeds to disintegrate and to disappear by absorption. This fact has been recorded and accepted with a degree of composure which is surprising, but the profession has paid no more attention to this all-important fact than to the passing of the summer solstice, and apparently the profession is an acquiescent in one as the other; being taught by some would-be authorities that the process of absorption is *natural,* habit leads the average individual into acquiescence.

But there should be no contention arising from the doctrine that whenever *any* senile change occurs in the human body which is so *seriously detrimental* to the organism as a whole, our most sincere efforts should be put forth to prevent this change, whether it be natural or not. It is entirely feasible to check and prevent this destruction and absorption of the alveolar process, and without this checking and suspending there *is* no treatment for pyorrhea, which is to say, that "without the baptism of healthy blood there is no remission of physical sins." Whatever little progress has been made and temporary improvement is had is in exact proportion to the revitalizing effect of treatment applied and in almost all cases it is only partial.

At the present time, as nearly as can be determined from recorded cases, not one per cent. of the cases applying for treatment recover, and this explains the corollary fact that not more than one per cent. of those who suffer the disease ever apply for treatment at all; deplorable, but true.

If we proceed with the usual methods of treatment, the removal of deposits by surgical means, and content ourselves thus in the hope of recovery, we are attempting to build a house on a foundation of sand; a stream is flowing beneath the foundation, and the sand is being washed away. It is the very common experience of the operator to remove the deposit, the so-called serumal as well as the salivary, to find that both these deposits are reformed. The so-called serumal is more difficult to remove, and when the disease has reached beyond the middle third of the root, there *is* no skill short of the Creator's which can remove it in entirety. But when this is as nearly consummated as possible, it is the common experience that deposits are reformed and surgical measures again are undertaken for their removal. The reason the deposit continues to appear is because the *bone continues to die,* and the lime salts become attached to the tooth. The absolute proof of this postulate and its part in the pathology of this disease is had when cases in large numbers are subjected to Bier's hyperemia in the jaw, and the absorption of the process is promptly checked, and the "serumal" deposit does *not* reform. (a) Proper medicinal treatment is followed by the exfoliation of the deposit and sequestra, and a redeposit of bone tissue takes place about the roots; the vital resistance is built up, atrophic changes give place to repair, the pockets are closed, suppuration ceases, the result of

(a) Hypermia in this condition has been suggested by Dr. Jas. A. Keefe, Chicago, 1908; Dr. Herman Prinz, St. Louis, *Dental Therapeutics,* p. 421; Dr. J. F. Colyer, London, *Dental Disease and General Medicine,* p. 102; Colyer testifies to checking of waste of bone. The author has under observation a large number of cases showing the same and believes he is the first to combine suction to produce at the same time drainage, massage and hyperemia.

the germicidal power of the arti-bodies; the teeth become firm, tenderness disappears, the gums show the normal color and rigidity, and the mouth is healthy; *the patient has recovered.*

Prevailing Methods of Treatment.

The time allotted to this writer is not sufficient to enter into the discussion of the various methods employed for the treatment of the metastatic manifestations of the disease. But in this connection let it be recorded as the belief of the essayist that vaccine therapy finds its *only* justification in pyorrhea treatment when it is by autogenous selection applied to such manifestations. But attacking the disease while yet localized in the mouth, in the alveolar process, unless the vital energy is restored to the tissues vaccine is of no real value, and with such restoration the vaccine and emetin alike are entirely unnecessary. In the local conditions we find that the dental profession has proceeded in the treatment of the disease apparently actuated and directed by the peculiar mechanical bent of mind which is the result of their study, their training and their practice.

Errors of Present Practice.

Little remains to be said, yet two very vital errors in the practice now in vogue must be pointed out. First, the subjection of the patient to the extraordinary hazard of surgical procedure which is now thought necessary for the removal of the last vestige of deposit. This remnant is damaging, mainly because it holds infection, and may be subdued by other procedures much more effectively than by instrumentation. The instrument should be used to remove such deposits as may be surveyed, and can be removed without material injury to live tissues, and then surgical methods should await until the final act of treatment, when scaling and polishing should be complete.

The second prominent misadventure in the current practice is the indiscriminate use of drugs in these lesions. Various and almost innumerable are the applications made. Some are applied because they are recommended, others because they are germicidal, and still others because they are said to be "healing." Drugs in pyorrhea should *never* be employed as a routine or perfunctionary practice, but when used at all the purpose should be distinct and definite and the agent selected must suit this purpose, and when the purpose is accomplished the drug should *disappear.* Any drug or foreign matter retained within the tissue is sure to be detrimental. No agent should be employed because it is "healing." Nature is the *only healer,* and our most *important* duty is to see that we *do not obstruct.*

Iodin Contra-Indicated in Pyorrhea.

The most sinful practice in employing drugs in this disease is that of using iodin. It is the most common drug used, and the most harmful. It aids the atrophic changes occurring in the alveolar process which constitutes the fundamental cause of the disease. All other factors, such as irritation from careless prosthetic work or from deposits or malocclusion, etc., and the consequent infection, are all secondary. It is therefore highly important that no agent be introduced into those tissues which will aid the retrograde metamorphosis, and this is the most conspicuous physiological action of iodin. It is the agent *par excellence,* which should be selected if we were seeking to defeat the cause we espouse. That iodin is destructive to the tissue cell, and by this method aids absorption of tissue, is so well known to medical men, and is supported by such authoritative research, that it is a source of great surprise that the dental profession has so universally fallen into this error. Remembering that it is our duty to check the absorption of the process, iodin in this practice must be absolutely abandoned.

Treatment Advocated by the Author.

The method of treatment which, in the author's observation produces marked improvement in all, and is followed by recovery in ninety per cent., is as follows: The general health having received attention, the enunctories stimulated, make an accurate and careful diagnosis and record it on the chart; see that each pocket is thoroughly explored with a probe and that the record shows the same; then cleanse the pockets by suitable drainage and remove such portions of the deposits as may be done without material injury to live tissues. Next use some form of acidulous escharotic; let it be of the strength of twenty-five per cent. sulphuric acid. If this is in combination with phenol, fluoride of ammonium, or the sulpho-cyanate of potassium, the mixture is perhaps more effective. (b) But let this be poured into the pockets by the use of a gold-pointed syringe; let it reach the remotest parts of the pockets, and it should be repeated once or twice a week until all suppurative conditions cease. This accomplishes the following results: First, it destroys the micro-organisms; second, it loosens the sequestra (c) and deposits; third, it changes the character of the lining of the pockets so that instead of the pyogenic membrane we have the surface oozing serum

(b) Each fluid ounce of the author's mixture contains twenty-five per cent. acid sulphuric, five per cent. phenol, twenty-five per cent. each potassium sulphocyanate and ammonium fluoride—water, alcohol, glycerine, Q.S., to make the measure. The solution should be clear without precipitate.

(c) The dead perecemental membrane and bone.

and plasma of the blood. This serum so neutralizes the acidulous radical that the area is now neutral, germless and drugless, a proper theatre for Nature's drama, the *"Renewal of Life."* Next, the vital conditions are aided by inducing Bier's hyperemia in the jaw. This may be accomplished in a variety of ways. Cupping by suction is perhaps the most desirable and should be repeated from day to day; the appliance should also drain and massage.

The author has observed a large number of cases treated in this fashion. The result is that the so-called serumal deposit disappears and does not reappear; the source of this being the destruction of the process, and this destruction having been prevented, the deposit does not exist. The salivary deposits are very readily removed by instrumentation, deposits are made more easy to remove if some of the acidulous preparation is used a few days in advance.

The title of this paper does not comprise it, but the importance of revitalizing the alveolar process is only partially expressed, unless we note the great importance of its support to *prosthetic dentistry,* as well as its great influence in the control and prevention of alveolar abscess, in addition to its inestimable value in pyorrhea.

Recapitulation.

I. The primary cause of pyorrhea is the devitalized condition of the alveolar process—death in mass of its marginal portion just beneath the gingival line, severs continuity and infection follows.

II. The death of the bone results in the lime salts attaching to the tooth root—the so-called "serumal" deposit.

Treatment. Cleanse the parts and provide for drainage, massage and *Hyperemia.*

Remove foreign matter by instrumentation, chemical solvents and suction drainage.

Treat the interior of the pocket with an acid strong enough to destroy micro-organisms, to loosen deposit and sequestra and to change the pyogenic membrane to a surface oozing serum and plasma, and repeat this until suppuration ceases and pockets are closed; then carefully scale and polish crowns and necks.

Instruct patients how to induce hyperemia, drainage and massage by proper appliances, and how often to do so, and to return in three months for prophylactic treatment, and thus keep a healthy mouth.

Studies of Endamoeba Buccalis.

By H. Page Bailey, Los Angeles, Cal.

Endamœba are very interesting masses of protoplasm, belonging to the class of animals called "Protozoa."

They possess the powers of reproduction, locomotion, and digestion, and are very sensitive to irritants such as light, heat, and chemicals.

Most forms of bacteria can withstand for several hours, a degree of heat that will in a very few minutes render the amœba motionless. A good microscope, with a one-seventh objective, a device for maintaining body temperature, plain slides, cover glasses and physiological salt solution, are the necessary apparatus for the examination of fresh specimens. I can get much better results from the examination of fresh or unstained specimen.

Technique of Examination for Endamoeba.

To the dentists who have not used the microscope I will give the following description of the technique.

To make the examination a chronic case I proceed as follows:

First, make radiograph of entire mouth; small photographic films give best results; then with patient in chair, place slide and cover-slip upon stage of microscope which must be kept at or near body temperature. With a capillary pipette drop a small quantity (say half a minim of physiological salt solution upon center of slide. To get specimen from case, first have patient wash mouth well with salt solution, then with irrigating syringe wash out contents of pocket thoroughly to get rid of as many bacteria and food particles as possible and dry parts thoroughly. Now with a flat scaler placed between the soft tissue and tooth, with the cutting edge against the soft tissue, proceed to the junction of the tooth and soft tissue, scraping the inside lining from the pocket, and quickly mixing this with the warm salt solution upon the slide; then gently lay down the cover-slip, having just enough solution to fill space between it and the slide.

Now it is ready to make short examination. If you wish to study

the specimen at length, place a layer of vaseline around cover-slip, to prevent evaporation.

After making several examinations you will find that if you have not thoroughly washed out the pocket, the specimen will appear full of bacteria of all shapes and sizes; also you will find in many cases, swift moving animals that dart here and there over the field, disturbing and penetrating the masses of débris, etc. As these are not from the depth of the pocket and are found in many places where organic matter has decomposed, I have not given them much attention.

Appearance of Amoeba.

When examining the amœba you can easily see two distinct zones, the inner zone containing large granules in some forms of amœba; then you have surrounding this a transparent outer zone which in some cases contain many bacteria. At times there appears to be a cell wall or limiting membrane surrounding the entire mass. You can see in the motion picture* how one form of the amœba changes location by use of the so-called pseudopods or false feet.

The Pathological Consideration of the Amoeba.

I have found that amœba are present in a large percentage of cases of dento-alveolitis. They are found in the absence of pus, and accompanied by pus. In all cases where I have found amœba, there has also been a venous congestion of the soft tissues at the cervix of the teeth.

In all cases of chronic dento-alveolitis, I consider it necessary to perform the mechanical toilet of the teeth and roots. In nearly all cases I have treated, this mechanical cleansing will do away with the exudation of pus, but if the amœba are present there is also that venous congestion of the soft tissues for months, which will disappear when you have forced the amœba to leave.

In acute cases of amœbic infection where there was no perceptible mechanical irritation I have had complete recovery by the use of emetin hydrochloride without the mechanical cleansing. One case of the acute type was referred to me by Dr. A. L. Shellhorn, of Los Angeles. He can vouch for me on that point.

In the other cases I have had the co-operation of Dr. Frank Zelinsky and Dr. L. H. Criley in the Auditorium Building of Los Angeles.

For many years a certain disturbance of the intestinal tract called amœbic dysentery has been recognized and treated by members of the medical profession. It has also been known for many years that in the intestinal tract of healthy individuals there may be found many amœba. The ones found in the healthy individuals are known as amœba coli.

*Author exhibited motion picture film.

Those found in the person suffering from amœbic dysentery are known as amœba hystolitica. Now is it not probable that we have a similar condition of affairs in the oral cavity? Personally I have not been able to find amœba in normal or healthy mouths, but they may be there as some authorities claim.

That the amœba is the cause of all cases of dento-alveolitis appears to me to be absurd, but I do believe it is an active factor in cases where it is found in great numbers. I do not believe emetin is the only remedy, but it is the most convenient I have found. That the amœba destroy bacteria to any great extent I do not believe. Here is a test you can try yourselves. Place in a test tube two c. c. of the patient's saliva; add to this some pus from a pocket; then add the scrapings of a pocket until you can get a specimen from the test tube that shows many amœba. Now incubate this mixture at body temperature for six hours, and examine for amœba. I have done so many times and at the end of three hours have been unable to find amœba.

Some Prevalent Errors in the Technical Phase of Operative Practice.

By Clarence O. Simpson, M.D., D.D.S., St. Louis.

The dental profession has recently been interested in oral foci of infection and pyorrhea specifics, almost to the exclusion of other topics. The relation of faulty operations on teeth, many of which are important etiological factors in gingival and peridental disease, is sufficiently close to merit consideration under this popular trend of thought, if its own established importance did not.

Intelligent dentists have long known that grave systemic disturbances must result from perverted conditions observed in mouths, but not until the medical profession was awakened to this prolific source of infection and exploited it, were dentists in general impressed with their responsibility in the matter and the possibility of their shortcomings being exposed. The practice of medicine althougn consistently aided by nature's resistance and recuperative power, is fraught with obstacles and failures. Physicians often baffled in spite of the advance in knowledge and methods, gratefully seized upon oral sepsis as the break in their scheme and are demanding the indiscriminate extraction of teeth. The expected results in many cases have not been attained but being adept at evasion, the confidence of the patient is unshaken and the ruthless destruction of dental equipment is the consequence. We know that the retention of some teeth and much dental work is a menace to health, but promiscuous condemnation without due deliberation and consultation is unjust and retrogressive.

Importance of Dental Operations.

Scientific investigation, bacteriological research, and rational theraphy are potent factors in the future progress of our field of endeavor, but even the most optimistic do not anticipate a time when reparative measures will not be required. The inception of oral pathological conditions occurs from neglect on the part of the patient and faulty operations by the dentist more often than any causes excepting malocclusion. Excepting those individuals with a marked predisposition, if patients presented themselves for dental inspection and attention sufficiently often

and dentists performed such services to conform with the highest standards of modern practice the gum tissue and peridental membrane would remain normal, pulp complications would not arise, and the opportunity for systemic infections from these sources could be eliminated.

This millennium is visionary, but casual consideration of it may give inspiration for higher accomplishments. The oral hygiene campaign has shown perceptible results and further dissemination may reasonably be expected, until a relatively large proportion of the public will be impressed with the value of dental conservation. The other factor involved, that of obtaining adequate dental service when sought is the plea of this paper: no revolutionary proposals but a reminder of some errors in operative practice which are minimizing the efficiency of dental restorations, if not actually important causes of initial lesions in the devastating chain of pathological sequelæ.

Prevalence of Inferior Operations.

Even limited observation discloses the prevalence of inferior dental operations, a slight conception of and a wide divergence from the existing standards of practice. Measured by these standards probably not more than 20 per cent. of practitioners are performing operations which would qualify them as capable and deserving of the responsibility with which they are entrusted.

Improvement of this condition can come only through a process of selection and elimination in dental colleges, barring men who do not display manipulative ability and mechanical ingenuity, then instilling in those accepted the proper ideals, as well as a thorough technical and scientific training, while the men in practice must be constantly stimulated and instructed by clinics, society work and study clubs. The science of dentistry is developing rapidly and close attention must be given to keep pace with its progress.

Oscillating Characteristics.

It is lamentable that dentists should be so susceptible to fads which are fostered by manufacturers and the profuse literature of the present. The radical changes and innovations in theory and methods which are periodically presented often make necessary the revolutionizing of practice and the augmenting of equipment, to obtain a doubtful or slightly improved treatment. It requires the keenest discrimination and decided conservatism to determine the real value of these suggestions, that advantage may be taken of the good and the impractical avoided. A recent example was the cyclonic advent of nitrous oxide analgesia promoted by manufacturers of apparatus and prostitute professional spellbinders, making startling claims of efficiency, humiliating accusations of cruelty in previous methods and roseate promises of

increased income, only to have as quickly lapsed into a state of innocuous desuetude.

The course of many of these innovations too closely conforms to that law of physics in which "action is equaled by reaction" and many times the decline of a fad is so rapid and positive that the value it may have possessed is lost. Notably that of porcelain inlays which from universal application and being considered indispensable, have fallen into disfavor until the indications for their use are being ignored on all sides.

Tendency to Dispense with the Rubber Dam.

A common error of operative practice is the too infrequent use of the rubber dam, the reveling in aquatic feats by the amphibious branch of our family—the submerged nine-tenths. Pulp canal treatment and filling is often jeopardized by neglect to apply the dam, hastening the operation, increasing the difficulties in maintaining a sterile field and sealing cavities, and permitting dilution of therapeutic agents. In cavity preparation to these disadvantages are added the increased sensitiveness of the dentin and inability to make careful inspection of the cavity; resulting in faulty preparation, particularly the leaving of decalcified structure not only in the deeper portions but superficially in structural defects and at the gingival on the approximal surfaces.

A facetious conclusion might be drawn that the profession has confused Dr. Sanford C. Barnum the "sire" of the rubber dam with the prominent circus man of the same name to whom is credited the statements "The public like to be humbugged," and "Some of the people can be fooled all the time and all the people some of the time." The boast frequently heard of the rare use of the dam, is reminiscent of those individuals who "do not use more than an ounce of dental alloy a year," a crude attempt at a subtle claim of superiority and an exclusive practice.

Unnecessary Pulp Irritations.

An objectionable feature in the gold inlay process as generally practiced is the tendency to prepare the cavity and secure the wax model without a thorough drying and examination of the cavity; then carelessly stopping the cavity until a subsequent sitting when the inlay is cemented with no attempt at cavity toilet beyond drying with an air blast. Where there is any difficulty in keeping the cavities sealed with stopping they should be protected by a temporary cement which by drilling into the body of it can be broken out without injury to cavity margins, and when the cavity has been exposed it should be washed with alcohol or better, sterilized with a suitable germicide.

Negligence in the use of protective media in deep cavities causes much pulp irritation which is preventable. The preparation is often

made deeper than necessary, 1 to 1.5 millimeters being ample for resistance form in most cavities. After removing the deeper decay a cement base should be placed before the metal filling and where there is no cement lining over the pulpal area a cavity varnish should be applied to give protection from thermal changes through the metal and in cementing the inlay from the hydraulic pressure exerted upon the liquid portion of cement. Since it is an established clinical fact that liquid may be forced some distance through dentin, temporary irritation if not permanent injury may result from this cause in deep cavities where the axial and pulpal walls have been formed with gutta-percha and removed before cementation.

Deficiencies in Cast Restorations.

The inspection of many cast gold restorations displays an impressive lack of appreciation of their possibilities and requirements, and technical skill in their construction. The introduction of the casting process conveyed an erroneous impression of a great saving in the time and labor required for operations. The ease with which a wax model could be formed, reproduced in gold and cemented in position made a "dent in dentistry," which the fruitful harvest of failures during these succeeding years has not effaced.

Many of the uses claimed for casting, particularly in crown and bridgework, have proven of questionable value from the difficulty of adaptation, and the weakness of cast gold as compared with solder. However, criticism of cast inlays, except that of time and labor required, has never applied to operations properly conceived and correctly executed, but has arisen from the extensive abuse of the method by the slothful and unscrupulous.

Some care in cavity preparation and manipulative ability is required to retain foil fillings even to completion of the high polish so dear to the exponents of hand mirror dentistry. With inlay restorations even this slight demand for skill has been dispensed with and a blind faith, quite admirable in a better cause, is displayed in the omnipotent qualities of cement.

Cement is a factor of importance in many phases of our work, success or failure being thus dependent upon its qualities even with perfect technique. The retention of ill-fitting crowns and inlays, shows a contrast between the product of the dentist and the cement maker entirely to the credit of the latter.

The lap joint quite properly advised for gold inlays has evidently been misinterpreted. It was not intended that the lap of gold should project above the enamel surface and beyond the cavity margins to an appreciable extent. Yet many inlays, which would be more accurately

described as "onlays" are seen covering the enamel fully a millimeter from the cavo-surface angle and terminating with a perceptible ridge, due to insufficient finishing or the breaking of a feather-edge, this defect producing a margin hardly conducive to comfort, sanitation, or service.

Errors in Cavity Preparation.

The scientific principles of cavity preparation formulated by Dr. G. V. Black have not been adopted by the profession as generally as their perfection warrants. They have been proven mechanically correct and criticism has invariably been unfair either from misconception or in deduction. These principles have standardized most of our operative procedure, yet a large proportion of operators choose the antiquated methods of the past, handicapping themselves and doing an injustice to their patients. Some over zealous followers of the system, however, have erred into ignoring the vital tissues concerned; injuring the alveolar dental membrane by too extensive foil restoration and jeopardizing the vitality of pulps in securing the "broad flat seats." The characteristics of supporting structures must be regarded in operations on teeth and a gingival seat of more than 1.5 millimeters encroaches too near the pulp. Resistance form is essential, but more skill is required to retain fillings in cavities of conservative depth than in these daring excavations. An extreme example of which, with no reference to those who strive for ideals, is that method sometimes employed without other resistance or retentive form to retain an amalgam filling in a pulpless tooth by inserting it in both the pulp chamber and the cavity. The removal of these necessitates the sinking of innumerable shafts, tunnelling at different levels and finally suggests the advisability of blasting.

Conforming Cavity Outlines to the Gingiva.

A striking fault to be observed in the preparation of cavities involving the approximal surfaces of teeth, the gingival wall of which should be extended under the gum margin is the neglect to conform the outline of this wall to that of the gingiva.

In text-books and in models almost without exception the gingival wall is shown as a flat surface labio-lingually and bucco-lingually, yet normal interproximal gum tissue presents a decidedly convex outline toward the cavity, and when absorption has occurred it may be irregular in outline or even concave but rarely a straight line. The freshmen students are taught to festoon a band for a shell crown on the mesial and distal to correspond to the curve in the gingival line. Why should appreciation of this anatomical point be limited to crowns?

The average extremes of the curve in the gingival line range from 3 millimeters on the incisors to 1 millimeter on the molars, most of which

occurs on the approximal surface from labial to lingual angle. Under these conditions a straight gingival margin of a filling is so far under the gum septum at its crest as to endanger its integrity, or emerges from under the gingiva before reaching a self-cleansing surface forming a most susceptible point for recurrence of decay.

A devoted disciple of the Black school who has displayed models of cavity preparation perennially for the past decade, rejected this suggestion because "it would complicate the cavity," which may as logically be claimed for any procedure beyond obtaining access and removing decay.

Restoration of Occlusal Form.

The reproduction of anatomical form in occlusal restorations has been suggested and practiced in the past, but whether the profession had not sufficiently progressed to appreciate its significance or whether the idea had not been so convincingly presented, not until Dr. J. Lowe Young's articles with the resulting discussions appeared has it received the deserved attention. The importance of normal contour and contact points is more generally recognized; yet this but partly discharges the obligation and will not retain the tooth in position, protect the soft tissues nor restore function if the occlusal form is imperfect. Normal conditions cannot be maintained without the practice of these principles which have been so commonly neglected. The acceptance of this idea by the alert men in the profession is assured and too much stress cannot be laid on it. Its adoption will necessarily be slow and a long period will have elapsed before the commensurate benefit will be derived from it. The existing text-books must be revised in this particular and the amusing illustrations of inefficient restorations showing no anatomical form beyond a marginal ridge and a concave surface replaced by others conveying the idea of typical occlusal reproductions.

This feature should be observed not only in gold crowns, inlays and amalgam fillings, but should be applied to porcelain inlays and crowns. The partial obliteration of carving in the baking of porcelain has been accepted as inevitable and substitutes of this material present a surface unfitted for normal function. This fault may be corrected by the use of cavity forming stones and suitable burs, in conjunction with an abrasive reproducing the occlusal planes and sulci, after baking and grinding to occlusion.

Contraindications for Silicate Cements.

The continued popularity and amendment in the properties of silicate cements requires consideration of them with other accepted filling materials. The kaleidoscopic changes by the manufacturers in formulæ and directions for manipulation, and the re-

latively short time for clinical observation has kept them in an experimental stage.

They have attained a stage of development where, with proper observance of their indications and care in their manipulation, they may be expected to retain their color, give protection from decay and resist the solvent action of the oral fluids for a reasonable period of service.

However, following the precedent of other new materials and processes, optimism has swayed prudence, without regard for limitations in strength and permanence, universal use of silicates has been attempted and proclaimed successful. A particularly pernicious practice is the use of materials of this character in cavities involving the incisal angles and the approximal surfaces of bicuspids and molars. The success claimed for these operations is based on the filling remaining in position and partially intact ignoring the loss of contour and contact occurring from disintegration, stress and interproximal wear, the resulting condition leaving the interproximal space unprotected and permitting a movement of the teeth affecting adjacent and even occluding teeth.

These results show conclusively that dependence cannot be placed in silicates, in their present imperfect state, to preserve the mesio-distal diameter of teeth or to withstand the forces of mastication. When their use is desirable for esthetic reasons in this class of cavities, that portion of the restoration exposed to stress and forming the contact point must be constructed of cast gold formed to retain a facing of silicate.

This concludes the arraignment of some conspicuous factors which have a material influence on the efforts to repair individual teeth and the more comprehensive ambition to maintain the efficiency of the entire denture, preserve the contiguous soft tissues, and promote the comfort and health of human life.

The difference between the skillful and the mediocre dental operator, likewise the capable and commonplace men in other vocations is largely dependent upon the attention to detail, and to just the degree that details are observed and mastered will proficiency be attained.

Dentistry has gained a recognition and has assumed a position of responsibility which demands progressive strides, and higher attainments than the past has produced. The operative branch must contribute its share; its deficiencies are obvious and intervention from collateral departments or professions need not be tolerated if we but utilize the scientific data and clinical experience at our command, and display diligence in coping with the problems which may confront us.

The Plantation of Teeth.

By M. J. Congdon, D.D.S., Berkeley, Cal

The subject is naturally divided according to the nature of the operation, into three heads, viz., replantation, transplantation, and implantation. Although these terms do not always signify the same thing with different authors, the generally accepted definitions are as follows:

Replantation. Replantation refers to the operation of restoring to its original socket or alveolus a tooth that has been removed therefrom either purposely or accidentally.

Transplantation. By transplantation is meant the operation of introducing into the socket of a freshly extracted tooth one that formerly occupied a different socket—usually a tooth from a different individual. By some, the planting in a socket not its own of a tooth from the mouth of the same individual is called replantation instead of transplantation. There are good reasons for this designation, but the latter term seems to be used by most authors.

Implantation. The term implantation is used to designate the operation of introducing either a natural or an artificial root into an artificial socket cut in the alveolar process.

Transplantation. Transplantation is interesting chiefly from its historical aspect and is practically obsolete at the present time. It was practiced in very early times, records of the operation dating back to the sixteenth century, and references to it continue on down almost to the present day. But while the great majority of cases recorded seem to have been failures, there were just sufficient successful, or partially successful ones to encourage new attempts. The operation, like that of replantation, was in early times made use of extensively by quacks for advertising purposes. Aside from the pain attending the operation, and the large percentage of failures, we have detailed instances of the transmission of disease by this process. Briefly, then, the subject of transplantation may be characterized as pain-

ful, very uncertain, dangerous, and not warranted by the experience of the past. The operation seems very properly to be abandoned at the present time. Whether it will be revived in the future under the guidance of modern surgery, when its physiological aspect is better understood, is a question for time to settle. It seems certain, however, that we must first look for success in the operation of replantation before we can expect much from transplantation.

Implantation.

Implantation is of much more recent origin than either replantation or transplantation, and credit for the introduction of the operation is given to Dr. W. J. Younger, of San Francisco, who first performed the operation in 1885. The subject at once aroused very great interest among the dental profession, and the operation was attempted by many under varying circumstances and conditions and with varying degrees of success. Dr. Younger seems to have achieved some satisfactory results, though the failures were many; two important causes of which seem to have been resorption of the root and exfoliation. The fact, however, that *some* of the operations seem to have been attended with success—Dr. Younger claims to have had successfully implanted teeth under observation for eleven years—may inspire further experiments along these lines in the future. If some cases are successful, why may we not reasonably expect all cases under favorable conditions to succeed?

Implantation of Artifical Roots.

Besides natural roots, artificial roots made of ivory, porcelain, metal, etc., have been experimented with, without, however, meeting with much encouragement. Of recent years, Dr. Greenfield, of Wichita, Kansas, has made rather extensive experiments with an artificial root made of irridio-platinum, in the form of a wire cage having a gold plate attached for retaining a porcelain crown. This cage is imbedded in the process by making therein a circular incision by means of a trephine of the exact size of the cage, leaving the core of bone in place. The theory is that by leaving a living and attached core the bony walls will reunite around the wires of the cage, thus forming a permanent artificial root capable of supporting a porcelain crown, which root will not be exfoliated; Nature tolerating it as she does a silver wire used to unite the parts of a broken long bone. This particular form of implantation is of too recent origin, and our data too insufficient to render a prognosis of much value. Implantation is from its very nature limited in its application, and seems to be too uncertain in its results to command in its present state of development very serious consideration.

Replantation.

This brings us to the consideration of the last division of the subject, viz., replantation.

The history of this operation, like that of transplantation, dates back to the sixteenth century, and probably even earlier, and like transplantation has been attended with varying measures of success. It has many failures to its credit, but the fact that some, at least, of the operations seem to have succeeded, has encouraged continued attempts and more careful study of the physiological conditions than was given to the earlier efforts. It will readily be seen that it is by far the simplest of the three operations, and naturally gives greater promise of success than either of the others. I think it safe to assume that if a tooth cannot be successfully planted in its own socket we need scarcely look for success when it is planted in a socket previously occupied by a root of different size and shape and nourished by a different individual; or when planted in an artificial socket drilled in the alveolar process of a different individual.

That in its early history many failures have attended the replantation of teeth is perhaps not so surprising as that there should have been some successful operations of this kind. This is evident when we consider the process employed.

The history of the earlier cases recorded is very meager in detail, and few are reported as under observation for sufficiently extended periods to show the permanence of the results, yet most of them show little care in execution or knowledge of essentials of procedure. Usually, no difference is noted in the treatment of vital and non-vital teeth. They were usually "washed and replaced." A little later we hear of filling the canals before replanting. Antiseptics were used in some cases, which practice is perhaps open to criticism. In some cases the tooth was not replanted for some time after its removal—in one case, at least, not until the following day.

The following are extracts from an article published in the *Cosmos* for September, 1914, called *"Indication of Technique of Tooth Plantation,"* describing the methods used by Dr. Sebba. The article is particularly interesting as indicating the object sought by some operators, namely, a method of fixation by ankylosis rather than a vital union of the soft tissues:

Dr. Sebba's Method.

"In regard to the many methods of replantation that have been suggested, Dr. Sebba condemns the notching of the tooth to be replanted, also the decalcification of the root by acids before replantation." The technique is briefly as follows: The alveolus from which the tooth

has been extracted is packed with iodoform gauze and the patient is dismissed. The root canal of the tooth is thoroughly cleaned and filled, as is the cavity. The pericementum is entirely removed with a scalpel and burs. The root is left intact and the tooth is laid in a very dilute carbolic acid solution until the next day. Before replantation, the gauze tampon is removed and the alveolus allowed to fill with blood. Then the tooth is introduced into the alveolus with a slight turning motion, which will cause some pain. It is then ligated to the approximating teeth with waxed silk ligatures, which must be carefully watched to avoid gingivitis or other irritations. After a week this ligature is finally removed. The tooth begins to become firm after that time, being absolutely rigid after about three months, without permitting the slight movement in a sagittal direction characteristic of normal teeth.

"The prognosis of replantation is generally favorable if the patients are willing to tolerate the pain of the first few hours, most favorable in molars, which are better protected against traumatic influences than anterior teeth. So far no means has been discovered of preventing the resorption of the tooth root, which after a few years produced loosening and loss of the tooth. Nevertheless, replanted teeth have remained in the mouth for ten or more years, thus amply justifying this method of tentative preservation." It will be noted from the above examples that one of two results—perhaps both—was very apt to follow as a result of replantation—viz., ankylosis or exfoliation, neither of which results would lead us to consider the operation entirely successful. We are looking for something better.

Method of Neumann, of Berlin.

Contrast the technique of Dr. Sebba with the following from Dr. Z. N. Neumann, of Berlin, and you will note the different angles from which the operation is approached by different men. The former seeks a bony attachment, the latter a vital reattachment of the soft tissues within the alveolus. The former seeks an unnatural mechanical attachment, such as might take place with almost any foreign body; the latter a natural reunion of the separated vital connective tissues within the socket.

"The author's technique is as follows: After disinfection of the mouth with hydrogen dioxide, the tartar present is removed from tooth to be extracted and replanted, and the gingival tissue within the field of operation painted with tincture of iodine. The tooth should be extracted under general anesthesia or under conductive anesthesia as advocated by Fischer, since topical injection would produce a disturbance in circulation which would unfavorably influence the healing process.

Every injury of the mucous membrane, or the periosteum, also fracture of the tooth, is to be avoided. The tooth to be replanted is washed in physiologic sodium chloride solution and its root surfaces are freed of all granulations, etc. The root apices are resected, if necessary, and the roots, if their divergent or tortuous shape as in molars, renders the reintroduction of the tooth difficult, are resected or ground off. The root canals if easily accessible from the pulp chamber are filled with paraffine thymol points; if the root apex has been resected, the pulp is removed from the apex and the canal filled with an ivory point. Before reintroducing the tooth into the alveolus, all coagulated blood and granulations are removed from the fundus and the replanted tooth is held in place by a celluloid splint. Replantation is contraindicated in multi-rooted teeth, if the X-ray shows that the root walls have become very thin owing to absorption, so that their fracture during extraction would be inevitable. If the root of an otherwise strong tooth has been slightly fractured during the extraction, the fractured portion can be removed and the tooth may still be reimplanted with success. Isolated teeth also can be replanted successfully, also deciduous teeth. In most cases replanted teeth become firm without complications and remain so regardless of the patient's age. Only in rare cases are the roots resorbed, and even if the alveolar process has disappeared to a great extent, as in pyorrheal patients, the replanted teeth are held firmly by a sort of firm connective tissue."

As a criticism of the above I would suggest that the tooth should at least be kept moist with the physiologic sodium chlorid solution instead of merely washing it therein—that the solution should be kept at approximately body temperature. I should also object to the resection and grinding off of divergent or tortuous roots unless this procedure were absolutely necessary. In other words, I should take great care to preserve the pericemental membrane adherent to the root, as well as that remaining attached to the walls of the alveolus from mechanical, thermal or septic injury. Again, Dr. Neumann makes no mention of the length of time that is allowed to elapse between extraction and replantation. As will be seen later on in this paper, this, from a surgical standpoint, is of great importance, as there is a limit to the length of time that excised tissue can maintain its vitality.

Dr. Sharp's Method.

Dr. James G. Sharp, of the Dental Department of the University of California, who has had perhaps a wider experience in replantation than any other man on the Coast, uses the following technique in the operation: He carefully protects the field of operation by means

of absorbent cotton, cotton rolls and sandarac varnish; the gums about the tooth to be extracted are painted with tincture of iodine, and the tooth is then extracted and immediately placed in a warm normal salt solution. The canals of the root are filled, but no excision of apex of the root is made unless necessary on account of eroded or roughened condition. If tooth is removed on account of abscess, curettement is made at the apex of socket, care being taken to preserve the side walls from all disturbance and drainage established by means of an opening through the gums and process to the infected area at apex of root. Great care is exercised to preserve perfect asepsis throughout and to injure the soft tissues of root and alveolus as little as possible. Dr. Sharp has examples in his own practice of replanted teeth that have stood the test for fourteen years and are to-day apparently as good as ever. He has been following the modern methods of replantation for about four years only. Dr. Sharp believes that when the operation has been properly performed there is quickly formed a vital union between severed parts of the pericemental membrane. He reports cases of replantation in which the teeth could have been easily removed with the fingers when first replanted—in fact, they would perhaps have fallen out by themselves had they not been mechanically retained—which in one week's time successfully resisted a very positive and considerable force exerted on them by means of the forceps.

Condition Warranting Replantation.

So much for the subject from a dental standpoint. Something has been achieved. Recent years have brought about great changes in our views of the subject with corresponding changes in the technique employed. The outlook is hopeful, but our experience is as yet too limited to justify overenthusiasm, or the acceptance of the operation as a panacea. If further experience should prove it an unqualified success, it would certainly open up a vast field of possibilities and go a long way toward the conservation of the natural teeth. However, in its present status we shall be wise not to make too free use of the operation. In the present state of our knowledge, I believe that replantation is justifiable only in the following cases:

1st. When a tooth has been forced out of its socket by accident.

2d. A tooth purposely removed in order to accomplish certain ends —as, for example, the extraction of a second molar in order to remove an otherwise inaccessible third molar.

3d. When, *as a last resort,* a tooth must be extracted for the relief of pain or to correct an otherwise incurable condition.

Under any of these circumstances we are bound to use every means

at our command to restore, if possible, the lost member to usefulness. These conditions occur with sufficient frequency in our practice to afford ample opportunities for experimentation, and we are not as yet justified in resorting to this operation for the correction of trifling disturbances.

Analagous Operations in Surgery.

If we turn now to the field of surgery we shall find much to assist us in our investigations, for the operation of replantation in its modern aspect is purely a surgical one. We find in surgery that a vast amount of experimental work has been done along these lines by men eminent in their calling, and that many highly interesting results have been attained. If we are wise we shall make use of these results in our further investigation of the planting of teeth.

Transplantation.

In approaching the subject from a surgical standpoint, a few definitions are essential to a clear understanding. "Transplantation," as employed in surgery, is a general term used to denote the operation of planting in the tissues of a living animal, completely excised living animal tissues or organs; while implantation denotes a similar planting of tissues from the cadaver.

Three forms of transplantation are recognized by the surgeon, viz., autoplastic transplantation, or autoplasty; homoplastic transplantation, or homoplasty; heteroplastic transplantation, or heteroplasty. By autoplastic transplantation is meant the planting of the graft on the tissues of the same individual from which it was taken, either on the same site or at a more remote location. This term, then, would be used by the surgeons to indicate the dental operation of replantation.

By homoplastic transplantation is meant the planting of the graft in a different individual of the same species, and is the term that the surgeon would use to denote what is commonly referred to by dentists as transplantation; while heteroplastic transplantation refers to the planting of the tissue in an individual of a different species. Practically all the tissues and all of the principal organs of the body have been experimentally transplanted, while the practical application of the operation is seen in the transplantation of skin, bone and other tissues. In general it may be said that while autoplastic transplantation of tissues has been successful, homoplasty has not resulted as favorably, and that organ transplantation has given little encouragement. While the transplanted organ has in many cases survived for a time in its new soil, it has functionated only for a very brief period.

Views of Dr. Lexer, of Jena University.

Perhaps the conclusions of Doctor Lexer, Professor of Surgery in the University of Jená, derived from the results of these experiments, may serve not only to show the present status of transplantation from a surgical standpoint, but also to shed much light on the probable ultimate outcome of this phase of dentistry. Again, our success in replantation will depend largely upon the same factors that determine the success of the work of the surgeon in transplantation. Dr. Lexer says: "The clinical result depends, among other things, on the type of tissue mass to be transplanted, as the more complicated in structure the tissue the more can we expect ideal histological healing. All types of tissue as connective tissue, fasciæ, tendons, fat, tubular vessels, peritoneum, cartilage and bone can be made viable in the homologous tissue of the recipient, and its regenerative powers increased with a consequent successful result, provided that substitution keeps pace with absorption."

"It is common knowledge that the best results are obtained by means of autoplasty, in which method the transplanted tissue is grafted into the body from which it is obtained. One must not believe, however, that a success, in the histological sense, is always obtained even in autoplasty, as here come into play the variations in the site of the graft, the condition of the wound, as well as the damage done to the transplant."

"Fibrous encapsulation is met with more frequently in homoplasty than in autoplasty, probably due to the irritation of a foreign proteid. This prevents proper nourishment of many tissues, and as a result substitution in the regenerative process occurs very slowly, while degeneration takes place rapidly."

Dr. Lexer cites the following properties as essential to a successful transplantation:

"1st. The transplant must have the ability when it is transplanted to grow upon the foreign soil. The first factor is the viability of the tissue, as it is dependent upon its own lymph and circulation for nutrition. This viability varies with the individual tissue, as the higher the development of the cell—as the ganglion cells, nerve cells, muscle cells, or parenchymatous cells—and the richer the tissue is in blood-vessels, the less likely it is to survive.

"2d. The transplant must be endowed with the capacity for extracting nutrition from the soil into which it has been planted.

"3d. It must be able to regenerate so that the disintegrating tissue is replaced."

Again he says: "In removing and implanting the graft, many factors

can easily enter which either weaken or destroy the properties, as drying, chemical contact or mechanical injury."

Pyorrheal Areas Not Favorable to Replantation.

And of vital importance to us in the operation of replantation of teeth, and which may well serve as a guide, is the following from the same source: "As important as the properties of the transplant are the qualities of the 'wound soil' which serves the function of supplying as quickly as possible nutrition to the graft. The first step in the establishment of the lymph flow and the circulation is the early adhesion between the wound edges and the transplant. The more quickly and surely this takes place the more promptly is nourishment assured. Should the cells of the wound be injured by antiseptic applications, or should they be abnormal because of the presence of scars or hæmatomata, or the seat of previous disease, as tuberculosis, necessary nutrition will be delayed."

This would seem to indicate that in the case of replantation of teeth a pyorrheal condition might materially interfere with the success of the operation.

"Very important factors contributing to failure are errors in operative technique, causing infection with a very slight transudate, which is instrumental in destroying the first intimate contact, thus preventing nutrition, partially or absolutely, and predisposing to partial or total necrosis, due to suppuration. By means of strict asepsis, this element of failure can be eradicated. Most important, however, is a second factor which prevents the early intimate adhesion of the wound edges, namely, imperfect hæmostasis. The presence of the slightest amount of blood is dangerous, as it interferes with the nutrition."

Compare this last statement with the technique of Dr. Sebba, as quoted above, in which he says: "The gauze tampon is removed and the alvéolus allowed to fill with blood. The tooth is then introduced into the alveolus with a slight turning motion," etc. In justice to Dr. Sebba, however, it may be said that he did not contemplate a vital union of soft tissues.

Dr. Lexer gives the following as rules to be observed in performing transplantation:

"Strict asepsis, complete hæmostasis in the wound, care in removing, handling and implanting the graft."

Views of Ullman, of Vienna.

The following quotation from Dr. Emerick Ullman, of Vienna, has a very important bearing on the subject under consideration. He says: "If one removes a portion of tissue from the body, it does not die at once, it retains its viability for a variable

length of time. The viability of this removed tissue varies according to the nature of the source and the type of the tissue—the duration of its life depends upon its environment, as the temperature, etc., and tissue from the more highly differentiated and organized animals dies sooner than that from the lower species." This, if correct, should dispose of the question of the life of the pericemental membrane when the operation has been properly performed.

Dr. Ullman sums up the subject of tissue and organ transplantation with the following conclusions: "The hopes which were entertained fifteen years ago regarding tissue and autotransplantation have been partially fulfilled; in heteroplastic transplantation it appears that the obstacle to success lies in anaphylaxis, while in homoplasty inherent biochemical characteristics interfere with healing. On this ground only can be explained the unsuccessful results of these types of transplantation as compared to the more favorable and more permanent results in autotransplantation. The cell protoplasm, specific for each organism, varies with the individual. There are as many protoplasms as there are individuals. Thus in homotransplantation the appearance in the body of a foreign protoplasm calls forth ferments into the circulation which destroy the transplanted tissue. The statement of Roux, which he made in 1895, that part of an organism will accustom itself to the surroundings in another organism, cannot in this era be accepted."

This would seem to present another and very important obstacle to the successful transplantation of teeth (homoplastic transplantation) in addition to that of difference of size and shape of root.

Views of May, of Oakland City.

Dr. E. S. May, of Oakland, who has done a great deal of experimental work along the line of transplantation, is not quite as sanguine of the ultimate success of replantation of teeth as some—is inclined to look upon the replanted tooth as a transplanted organ rather than a transplanted tissue, and feels that Nature would be inclined to treat it as a foreign body to be absorbed, encapsulated or exfoliated.

I propounded the following questions to Dr. May and quote here his answers. I believe they are vital to the subject:

1st. "In case of a successful autoplastic transplantation of tissue, say of periostium, would you look for any histological change in the transplant, provided the 'wound soil' were of the same kind of tissue?"

Answer. "I would not expect any immediate changes in such an autoplastic transplant. Later on fibrosis might result."

2d. "Would you expect under the above conditions any functional change in the transplant?"

Answer. "No functional change in the transplant unless fibrosis did occur."

3d. "Would you expect in all cases, under the conditions of (1) that there would be in time a complete disintegration and regeneration of tissue so that the original transplant would be gradually but completely eliminated?"

Answer. "I would expect in time disintegration of transplant with replacement fibrosis. I do not believe there would be regeneration."

This constitutes a brief outline of our avilable knowledge of the subject at the present time. Just what takes place in a so-called successful transplantation no one, so far as I am able to learn, seems to know. It is not enough to know that the replanted tooth remains in place and seems to be firmly attached. We should know how it is attached and the histological nature of that attachment. To gain this knowledge I believe there is but one way, and that is by means of sections obtainable only from the cadaver. The time has come when the dentist must, in my estimation, gain his knowledge of this and kindred subjects, as does the surgeon when similar problems arise, viz., through post-mortem investigation.

Emetin vs. Surgery in the Treatment of Pyorrhea.

By Thomas B. Hartzell, M.D., D.M.D. Professor of Oral Surgery, College of Dentistry. Professor of Clinical Pathology, College of Dentistry. Research Professor of Mouth Infections, School of Medicine, University of Minnesota.

(In part the product of the Scientific Foundation and Research Commission of the National Dental Association—T. B. H.)

This will be a very short paper, as it is intended to convey the results of the administration of emetin hydrochloride locally and hypodermically to a series of fifty cases. Though we will not give in detail the history of each one of the fifty cases, we will detail a certain number of them.

Case I. Case number one was a man fifty years of age, who had exhibited a very slow and chronic pyorrhea, which had been treated by surgical removal of dead root surface and curettage of the pockets. The result obtained had been imperfect, some suppuration still existing about four teeth. Amœbæ being present, it was thought worth while to supplement the surgical treatment by the administration of emetin. This patient received in all fifteen injections into the four pockets, which still showed suppuration. These injections were given during the fall of 1914. The patient is still under observation and still shows some discharge of pus from these same pockets. The emetin in no way checked the discharge and the case remains the same as before administration. I might add that all the emetin used in these cases was tested out against animals and was found to be active.

Case II. The second case was that of a child twelve years of age who was rapidly losing all of her teeth, but still had present the upper centrals, cuspids, and bicuspids, the lower second molars, bicuspids and cuspids. The gums, swollen, red and very painful to the touch, yielded very poorly to local anesthesia, making surgical treatment exceedingly difficult to perform. Therefore, emetin hydrochloride was administered as the last hope. This child had in all some twenty odd injections of a one per cent. solution made into her pyorrhea pockets, and in addition to the local injection received the routine dosage advised by Bass and Jones, administered hypodermically.

No change whatever was produced in the mouth, though the treatment was faithfully given. The child has since lost all of the upper teeth and all of the lower, except the two bicuspids, the mouth being edentulous with the exception of the two teeth and the wisdom teeth which have not yet erupted. The child is vigorous, healthy, red-cheeked, in fact, remarkably well and with the handicap of no masticating apparatus.

Case III. The next patient, two and a half years old, presented a green stain on the necks of all her deciduous teeth and considerable pus oozing from the gum margins of all of her teeth. The pockets had an average depth of one-eighth of an inch. In view of the fact that this child was very timid and exceedingly fearful of operative interference of any sort, local injections of emetin into all the pockets were practiced until fifteen injections had been given. In addition to this local treatment, this child, two and a half years of age, was given three doses of one-sixth grain of emetin hypodermically. No discernible change has been wrought in the tissues. They are still angry and inflamed and still discharging as much pus as when the treatment was undertaken.

Case IV. Case number four was that of a man forty-five years of age, who had a sluggish pyorrhea particularly evident in the bicuspids in both upper and lower jaws. This patient had a blood pressure of 185, and his urine contained, when first examined, three per cent. of sugar. Surgical treatment was attempted and carried forward with indifferent results. Emetin was administered hypodermically, three and one-half grains being given, one-half grain on three successive days, then three half grains on alternate days, then a rest of two weeks, then one-half grain, making in all three and one-half grains of emetin hydrochloride. The patient exhibited a marked general improvement in health. His resistance to physical wear and tear was considerably increased and he felt quite hopeful of cure. The sugar in his urine decreased quite markedly, but the suppuration about the teeth continued in spite of the use of emetin.

We then commenced the local use of emetin and injected it from time to time without any material change in the suppuration. Being exceedingly anxious to get rid of the infection, we checked up the root surface work carefully, then gave a series of injections of phenol, one part; tincture of aconite, two parts; tincture of iodine, three parts; glycerine, six parts. These injections were delivered into the pockets with a hypodermic syringe armed with a blunt-nosed needle. Under the iodine treatment we had the pleasure of seeing all suppuration cease, so that at the present time nothing can be squeezed by firm pressure from these pockets.

Case V. Case number five was that of a woman fifty-five years of age, who has suffered from pyorrhea for a number of years, having lost a number of her teeth by reason of its presence. Five half-grains of emetin were administered, one-half grain per day for three days, then two half-grains on two alternate days. After the last dose was given, the patient was seized with a terrific spasm of vomiting which lasted for several hours and caused great alarm, as the physicians who were called in charge of the case could not check the vomiting. No known cause of the vomiting was ascribed, unless it was the accumulative effect of the emetin. Slow recovery was made from the emesis. The tissues about the pyorrhea pockets remained much as before, tumid, swollen and still discharging some pus. Owing to the unsatisfactory result of the emetin administration, the patient has had no further treatment.

Case VI. Case number six was that of a woman forty years of age, who exhibited a chronic pyorrhea of long standing with several teeth absent from the arches. Treatment of one side of the mouth was undertaken surgically, and five doses of emetin hydrochloride administered hypodermically were given in the usual routine. I should say here that we use the glass syringe with metal plungers. The glass barrel and metal plunger can be taken apart and boiled. The needles used are platinum needles, and in addition to boiling they are burned in the flame before use. In preparing the patient for hypodermic injection for either vaccine or emetin hydrochloride, our custom has been to wash the area where the needle is to be inserted with alcohol, then after injection has been given to touch the wound made with the needle with tincture of iodine. This precaution was taken as usual with this case. Nevertheless, following the second injection the patient developed a red tumid swelling about half the size of an orange. This swelling was exceedingly sore and painful for three or four days, after which the skin cracked open, spreading apart some little distance, leaving a group of tender, raw-looking crevices. This was protected with carbolated vaseline and an arm shield, and after a period of five or six weeks slowly disappeared. The emetin hydrochloride used in this case was that obtained from Burroughs, Wellcome & Company, and was prepared by dropping the one-half grain tablet into boiling Ringer's solution. This kind of an inflammation following the use of emetin administered hypodermically has been noted in some six cases of the series. Why it arises I am unable to say. I have never noticed anything comparable to it and I am of the opinion it is chargeable to the chloride or perhaps to some chemical change resulting from the

boiling of the alkaloid. Because of its inconstancy we thought possibly it might be due to infection, but such great pains had been taken, the boiling of our syringe, needles and solution, that we feel safe in stating that it certainly was not an infection, nor do the areas of inflammation behave as do those areas of infection known to the author.

In quite a number of cases we have had large black and blue areas, which usually change into yellowish green and finally fade out.

We continued the use of emetin hydrochloride in the college of dentistry, and our routine was in every case to examine for amœbæ, and, when finding them, to follow the case through with a series of hypodermic injections of emetin. The emetin was administered by our head nurse, and the subsequent observation of the cases was made by Doctor H. J. Leonard, who had charge of this clinic, the writer seeing most of the cases with Dr. Leonard from time to time. Doctor Leonard is authority for the statement that save for one exception he failed to see any benefit from the use of the emetin treatment. In one case we felt reasonably sure that there was a considerable reduction of inflammation and a lessening of pus flow, although not a complete cure. After waiting a sufficient period of time to reasonably expect cessation of pus flow and reduction of inflammation, we re-examined these cases for amœbæ, usually failing to find them immediately after the emetin treatment, but in the course of a few weeks those cases which we have re-examined still produced amœbæ. On the whole, our experience gained from the administration of one quart of one per cent. emetin hydrochloride solution and one hundred grains of emetin hydrochloride has been distinctly unsatisfactory, as the results obtained have been in no way comparable to those gained by clean, careful surgery of the root surface.

Surgery in Pyorrhea Cases.

Surgery of the root surface has been practiced successfully since the time of Riggs, who in 1867 gave a clinic before the Connecticut Valley Dental Association, in which he demonstrated the entire successfulness of surgical treatment properly administered, and we have had in this country since the time of Riggs many successful operators who have been able to secure cessation of pus flow and the return of hard and pink gums as a result of the surgical treatment. No one has a mortgage on the method of producing this result. Doctor D. D. Smith, of Philadelphia, is perhaps one of the great pioneers in this field. His work has stood the test of time. Doctor Younger has also left an enviable reputation in the fields where he has worked. Tomkins, Patterson, Fletcher, James, Skinner, Hutchinson, Stewart, Conzett, Buckley, Logan, and many others have produced and are now producing results that are

satisfactory to both patient and operator. It is probably strictly true to say that none of these men worked with the same type of instruments. The kind of instrument used is not the secret of success in the treatment of pyorrhea. The secret of success lies in a correct understanding of the anatomy of the root surface and perfect curettage of that root surface, followed by such careful prophylaxis that the infection does not have an opportunity to regain a foothold, and as a choice between therapeutic treatment and surgery, surgery seems by far preferable. It is as illogical to expect a dirty root surface to become healthy from the injection of a therapeutic agent as it would be to expect an old infected wound with dead bone or foreign matter in it to become healthy by therapeutic means. Clean surgery and careful prophylaxis will give by far the greatest percentage of cures. It may be possible that there is a beneficial result which will flow from the use of emetin chloride as recommended by Bass and Johns, and Barrett and Smith. It would seem that in two of our cases we have had a benefit which should not be ignored, even though we have not secured the fine type of healing that follows clean surgery and careful subsequent prophylaxis. Many men are now studying the secondary effects of emetin hydrochloride, and my own feeling in the matter is that we should hold our final judgment until two or three years of observation has been given to patients who have been afforded treatment by this remedy.

Surgical Treatment of Pyorrhea Alveolaris.

By J. C. Jones, D.D.S., Portland, Oregon.

An ounce of prevention being better than a pound of cure, the best time to treat pyorrhea alveolaris is in its earlier stages, or even before it has started.

Pyorrhea alveolaris means a flow of pus from about the necks and roots of teeth *in situ,* and is really an infective pericementitis. By infective, as here used, I mean that the tissues about the neck and roots of teeth are infected, invaded, or attacked by pyogenic micro-organisms, which, together with other local irritants, cause a continued breaking down of the tissue, and if neglected, an ultimate loss of the teeth by exfoliation.

By a cure, we expect a cessation of the pus and inflammation and in many cases a redeposition of at least a part of the bony process about the roots of the teeth. If the tissues have been destroyed for two-thirds or more of the length of the root of a tooth, the tooth may best be extracted, as we cannot restore the dead to life.

Remember this, our teeth are valuable, and many teeth, though they may be so loosened as to be apparently hopeless, by proper treatment may be restored to many years of usefulness. Do not destroy another's personal property. If we must err, let us err by trying to save rather than to err by destroying that which might have been saved through careful and proper treatment. When a physician is called to treat what seems to be a hopeless case, does he throw up his hands and say nothing can be done, take his bag and go home? He certainly does not; he goes heartily to work and does his best.

Examination.

The average patient presents with a more or less unclean mouth, more or less recession of the gums and loosening of the teeth, pus exuding from about the necks of the teeth; more or less calculi, both salivary and serumal; gums red to purplish red, bleeding at the slightest touch, fetid breath. Closer examination with instruments reveals deep pockets on one or more sides of the roots of the teeth, and frequently complicated with apical abscess.

The direct cause of pyorrhea alveolaris is any local mechanical irritant, such as plaques, soft accumulations allowed to remain about the necks of the teeth, calculi, faulty dental operations, and malocclusion.

Surgical Treatment.

Surgical treatment consists in correcting occlusion by grinding the teeth at certain points to relieve the excessive unbalanced strain. Removal of superficial deposits with any suitable scaler; I prefer a Peeso number one; correcting faulty dental operations, *i. e.*, the removal of overhanging margins of fillings and inlays, band crowns; replacing faulty fillings and the removal of such other mechanical irritants as may be found.

Polishing Enamel.

The enamel surfaces of teeth, contrary to popular belief, are not smooth, but very uneven and rough, or wavy, making it easy for food débris, plaques, etc., to cling.

With fine carborundum stones, grind the ridges even with the hollows, and reduce all angles to graceful curves; follow carborundum stones with Arkansas stones and powder, then with discs, and finally with whiting and oxide of tin, until enamel has a mirror-like surface. The object of this is to place the crowns of the teeth in such a condition as to be easily kept clean.

Treatment of Roots.

The treatment of the roots of the teeth must be done with suitable instruments. They must not be clumsy, and should be so constructed that the length of the blade shall not exceed one-half the diameter of the shank; the cutting edge should be at right angles and in direct line with the long axis of the handle. The material and temper of these instruments must be of the very best. The blade should be so constructed and sharpened that it will not lacerate the soft parts, and will, by successive strokes or pulls, plane away all calculus and dead remnants of the peridental membrane, but will not cut deeply at any one movement. In the set used there should be sufficient number and forms to enable the operator to reach any part of any tooth in the mouth. The set I use, designed by Dr. C. M. Carr, consists of 150 instruments, so arranged that it is easy to select a suitable instrument for any part. They are arranged in groups of eight, the blade of each successive instrument being virtually turned forty-five degrees on the axis of its shaft from the preceding one, so that the group of eight instruments will complete the circumference of the tooth from the same finger-rest. The shanks are arranged in two angles, acute and obtuse, the acute to better reach around a corner.

There are three lengths of shanks, short, medium and long, to better

reach the different surfaces of the various teeth. In each angle and length of shank there are three forms, concave, straight and convex, for convex, flat and concave surfaces, and with these various forms one can reach any part of any surface of any tooth in the mouth.

A dentist soon learns by the sense of touch on the handle of a broach when he is approaching the apex of a root canal, or if there are any remnants of the pulp in the canal. We must cultivate this sense of touch in treating pyorrhea, so that we become able to judge the different tissues and densities that we are working upon. The instruments that I have described are used with a drawing motion, after the manner of a Japanese plane, and will remove only a thin layer at each stroke.

After all calculi and dead remnants of the peridental membrane have been removed, polish the neck of the tooth with dental tape and suitable polishing powders.

Instruction to Patients.

Last, but not least, we must instruct our patient and secure his future co-operation, or the work will be for naught. The patient must be taught the proper manipulation of the toothbrush, wood-polishing point, dental tape, etc. He must be guided to form the habit of cleansing the mouth frequently. It is only a matter of *habit and know-how,* which few of the laity have, to keep the teeth clean after they have been properly treated. Habits of mastication must be looked after. There are many people in this world who seem to think that their teeth are merely for ornamental purposes, and are to be used with extreme care for fear that they might be worn out. These people form the habit of dipping their toast and hard bread crusts in some beverage to make it soft and not require much chewing; their teeth soon become tender in the alveoli, so that they can bear very little stress upon them; they avoid shreddy foods, tough meats, etc., that require any considerable effort at mastication.

Patients should be taught that cooked starchy foods, even though soft, should be well masticated and thoroughly mixed with the saliva, so that the ptyalin may perform its proper digestive function.

Toasts and bread crusts abrade the surfaces of the teeth and help to remove the gelatinous plaques that form. Shreddy foods well chewed perform the same function. Fletcherization is one of the best habits that we can form.

In the final summing up of the treatment of pyorrhea alveolaris, remove the cause and Nature will do the rest. Medicines are absolutely unnecessary.

The Sharpening of Hand Instruments.

By R. B. Giffen, D.D.S., Sacramento, Cal.

Hand instruments for cutting teeth in certain stages of cavity preparation are superior to burs or stones, but it is necessary that they be sharp and be kept sharp. The difficulty of keeping such instruments in proper condition is, perhaps, responsible for the general use of the bur.

Cavity preparation after Black is becoming more generally accepted as time goes on, but flat walls and floors and sharp angles cannot be obtained without the use of hand instruments for the major part of the cutting. Any attempt at cavity preparation, with Black as a standard, will fall far short of ideal if made with burs. The bur seems to furnish an easy method, for no one hesitates to throw aside a dull one, and it does furnish the best means of doing certain work. As an adjunct to hand instruments it is invaluable, but no attempt is made by most operators to sharpen their burs, as it is impractical for them to do so; in contrast with the bur it is impractical for the operator not to sharpen his hand instruments, which will do better work, do it more quickly and with less pain than the bur if they are sharp and used intelligently.

The time required for the sharpening of such instruments is not to be ignored, but the difference in results makes such time well spent. A desire to reduce this time and also to obtain a knowledge of how this work is done by the manufacturers who sharpen in large quantities led to the preparation of this paper and the making of a machine for that purpose, which will be shown in operation at a clinic. No definite knowledge has been obtained on the sharpening of dental instruments, as it seems that this is an art that cannot be taught from books or letters.

Views of Manufacturers.

A number of questions were submitted to several manufacturers of tools, the most important being: "Is there any scientific information to be had on the sharpening of instruments?" The following quotations give the concensus of opinion in regard to that question.

Mr. E. C. Peck, General Superintendent of Cleveland Twist Drill Company, says: "We do not believe the sharpening of tools has been

reduced to a science, as we understand the meaning of the term. We would rather state that the sharpening of tools is an art acquired by long years of close observation and practical experience."

Mr. W. C. Curtis, of Cleveland Dental Manufacturing Company, said: "Expert sharpening of instruments depends largely upon a highly developed and acute sense of touch. The men who do this work do nothing else; in fact, lifting a heavy object would unfit them for this work for an hour perhaps."

One dental manufacturer, who replied, says that their knowledge is the result of long experience and constant experimenting, combined with a theoretical knowledge of angles and a great deal of testing to determine the correct angle for proper clearance. Another said: "In the full line of dental operative instruments manufactured by us the bevel of the cutting edge has been worked out by our factory engineers. In cases where the name of a member of the dental profession is associated with the instrument or set of instruments, the bevel has been worked out by our factory engineers in conjunction with the dentist who invented or suggested the instrument."

Black says: "In operating at the chair the stone should always be conveniently at hand for correcting the edge of any instrument that is not just right." This does not seem to be good practice. Duplicates should be at hand to be used in such cases, all sharpening to be done at other times than when operating. Another statement of Black's (and a method in common use) is that the finger nail is sufficient to test the edge of an instrument. This does not seem to be good practice. The use of a one or two-inch eye-loupe will give far better results if really sharp instruments are desired. Otherwise, his directions for sharpening are good, provided that one can follow them; in fact, the best I have found that can be applied to dental instruments, but the results, as said above, will depend on the ability of the individual.

In answer to a letter in regard to insuring good results when the instruments are sharpened by the dentist, one manufacturer said: "The truth of the matter is, and we presume we had better confess it, that we do not know. It is something like a man using a razor. Theoretically, every man who shaves should be able to hone and strop a razor, but few can do it! In the same way, theoretically, every dentist should be able to sharpen an instrument, but the fact of the matter is that he cannot do it."

Practice in Machine Shops.

In large machine shops modern practice provides a tool room where all tools are sharpened in tool grinders by men trained to that work, the men who use the tools not being permitted to do any grinding.

In small machine shops, and with most other users of cutting tools, the tendency is, as it is with dentists, to be satisfied with indifferent methods, the results depending upon the natural ability of the man doing the work.

Taylor's Experiments.

Judging from the results of Taylor's work in cutting metals, much might be done on the cutting of enamel and dentin. The conditions are, of course, entirely different, and similar percentages of gain could not be expected, as a large part of the gain was due to the discovery of high-speed steel.

Still large gains were made from other discoveries or changes from what had been standard practice. A change of 7° in the lip-angle of the tool from 68° to 61° gave an increase in cutting speed of 20% on soft steel, while the same change on cast iron showed a loss of 2.23%.

Taylor's work extended over a period of twenty years, during which time he made about 50,000 tests and cut up over 800,000 pounds of metal.

The Lip-Angle.

The dental manufacturers did not give the lip-angle of their instruments, so an attempt was made to determine this angle by measurements of new instruments, but the variations, as given below, were such as to leave much doubt. Some experiments were then made to determine, if possible, the correct lip-angle, which seems to place it at between 60° and 70°.

The measurements of new instruments were then compared with the instrument sharpened in the office with the Weithoff holder, by hand and with the machine mentioned above, which is, in part, a development of the Weithoff holder. This comparison showed that we obtained better results in the variation of the lip-angle with the Weithoff holder and by hand, while with the machine the variation was very much less than all with the exception of manufacturer No. 2, enough of whose instruments were not available to make a fair comparison.

These measurements were made with a magnifying glass and protractor, and while not absolutely accurate, are sufficiently so to emphasize the fact that sharpening instruments is not a science in the dental manufacturing world, and that the results obtained are not comparable with the results on machine tools by using tool grinders.

Manufacturer.	No. of instruments measured.	Lip-angle. smallest	Lip-angle. largest.	Variations of angles.
No. 1.....	46	45°	114°	69°
No. 2.....	5	45°	52°	7°
No. 3.....	65	45°	107°	62°
By Assistant. (Weithoff Holder).	50	45°	83°	38°
By Hand	48	45°	71°	26°
By Machine	50	62°	67°	5°

In the last group 65° is taken as a standard.

The variation in all classes of instruments shows the need of standardization and a means of producing a standard lip-angle, for the efficiency of a tool depends greatly on a correct lip-angle, or at least an angle that does not vary too much. Conditions in cutting teeth in the mouth are, of course, very different from that of machine work, where the tool can be held in a constant relation to the work, but it would seem that a considerable improvement would be made in an instrument by experiments that would determine the proper lip-angle.

Composition and Temper of Steel.

As the formula of the steel and the temper are vital factors in the efficiency of a cutting edge, it might be well to review briefly those factors. Tool steel contains from .75% to 1.5% of carbon. Slight variations in the carbon content appreciably affects the properties of the steel, .1% being sufficient change progressively from .65% to 1.55% to make tools suitable for nine different purposes. The manufacturers will not give the exact formula of the steel used for their instruments.

Carbon exists in steel in two forms, hardening carbon, martinsite or cementite, and softening carbon or pearlite. When steel is heated to 1,450° F., or slightly above that temperature, hardening carbon is formed, called "decalescence." If permitted to cool slowly to below 1400°, softening carbon is again formed, called "recalescence." This will occur between those temperatures or critical points every time they change. The critical points vary with the formula of the steel. By cooling rapidly from 1450° to 390° the carbon does not have time to change from hard to soft and the steel is made hard. It is then tempered, or the temper is drawn by heating slowly to 430° to 450° for faint yellow to pale straw, and on up to 600° for dark blue. The colors are due to a film of oxide which grows thicker and of a deeper shade as the temperature raises.

Requirements in Sharpening Tools.

In sharpening of instruments there are several things to consider.

The stone or other abrasive.

Care of the stone.

Smoothness and keenness of edge.

The lip-angle, clearance and cutting angle.

The lip-angle, also called bevel, tool-angle and rake, is the angle between the surfaces forming the cutting edge.

The clearance is the angle between the instrument and the surface cut.

The cutting angle is the sum of the lip-angle and the clearance.

Arkansas stone seems to be the best suited for all classes of small tools, as a hard stone is necessary to prevent the tool from cutting the

stone. It is very likely, however, to leave a fine wire edge which is difficult to remove or prevent. The wire edge can be felt on the finger nail and interferes considerably with the cutting of the instrument, as is the case in all classes of tools. Reversing the instrument does not always remove the wire edge, but frequently turns it back, so that while the edge feels sharp the first cut crushes it and the instrument is practically dull before any cutting is done.

Pike Manufacturing Co., on the care of the Arkansas stone, says:

"To retain original freshness of the stone, it should be kept clean and moist. A new stone should be soaked in oil for several days before using. Wipe it off immediately after using, put on a few drops of oil and keep covered. The proper use of oil will prevent glazing, and using all parts of a surface, not just the middle, will keep it flat."

Four different stones and an emery disk in the hand piece have been tried, but the Arkansas is the only one that can be used for this work. However, the best results have been obtained by using the Arkansas first and then using the light-colored side of a Belgian razor hone. This is a natural stone and very soft that cuts and scratches very easily, and would have to be resurfaced or renewed frequently or to be used with the greatest of care, unless used with a holding instrument that would prevent the instrument from taking any but the proper position on the hone. This combination gives the keenest edge and the smoothest under the microscope, which cuts fastest and lasts longest. So far as my experiments have gone, this combination of Arkansas and Belgian stones leaves little to be desired so far as the edge is concerned, but to get the results the instrument must be transferred from one stone to the other in the same relative position.

Very satisfactory edges can be obtained with the use of the Arkansas stone alone when a holding instrument is used, if after the tool has been sharpened with ordinary pressure the motion is continued with light pressure. This will remove the wire edge and leave a very sharp tool.

The disk gives a keen and comparatively smooth edge under the microscope, but it is too inaccurate and wears too fast and tears too easily for general use, with one exception. This exception is in the sharpening of spoons. The lip-angle of spoons is not so important as other classes of instruments, for they are used chiefly on soft material. A keen, thin edge is necessary, but the edge should not be too thin, for it will then become dull too quickly in contact with sound dentin. Owing to the shape of the cutting edges of spoons, it is necessary to keep them in a rotary motion to reach all parts; this can be very well done with a little care on the disk in the hand piece.

Lip-Angle for Tooth Cutting Tools.

A lip-angle of approximately 60° to 70° seems to give the best results for all classes of instruments for cutting sound tooth structure. A smaller angle than 60° tends to choke by taking hold of more than can be cut through and gets dull more quickly, while a greater angle than 70° does not take hold so readily and requires too much side pressure to feed it.

Theoretically, both the temper and the lip-angle should be different for cutting enamel and dentin, but practically it would be almost impossible to confine each to its special work if such instruments were made. The best method is to have enough duplicates to provide a sharp instrument when the one in use becomes dull. Many experiments would have to be made to determine the relative importance of the lip-angle in dental instruments, particularly to determine the effect of the non-constant relation of the tool to the work as contrasted with the constant relation of a lathe tool.

Horner says: "The principles underlying the angle of a cutting tool are these: The edge formed by the meeting of the upper and lower facets must be sufficiently keen, that is, must possess sufficient wedge formation to penetrate and sever material; it must also be strong enough to retain its keenness of edge with reasonable permanence without the need of frequent regrinding. The result is that tool formation is always a compromise, a balancing of conditions a keen-cutting angle being opposed to the strength and permanence of the cutting edge."

Tools of high quality have been used since the days of the Pyramid builders, but during these thousands of intervening years no exact science of tools has been formulated, and so a great deal of what some would term empiricism still rules in the shops. There are no exact angles of cutting tools and no exact formations of tools' edges of which one can say confidently, "These are the best."

Though Taylor gives a list of cutting angles as follows, he says that much good would probably come from careful experiments on the subject of lip-angle, and says further that the most important consideration in choosing a lip-angle is to make it sufficiently blunt to avoid danger of crumbling or spalling off at the cutting edge:

Very soft steel, less than	61°
On soft steels	61°
Harder steel	68°
Hard steel	74°
Chilled iron	86° to 90°

Horner also says: "It would seem desirable in these days of formulas to be able to put the problem of tool edges into a nutshell, but

neither the writers on the subject nor the practical men in the shops have yet accomplished this. Either would have done it if the task had been easy, but the difficulties have been too great. It is true, as a rule, the softer the material operated on the more acute can the angle be made; the harder the material operated on, the more obtuse must it be. When the working face or the top face of a tool stands at an angle of 90° or more

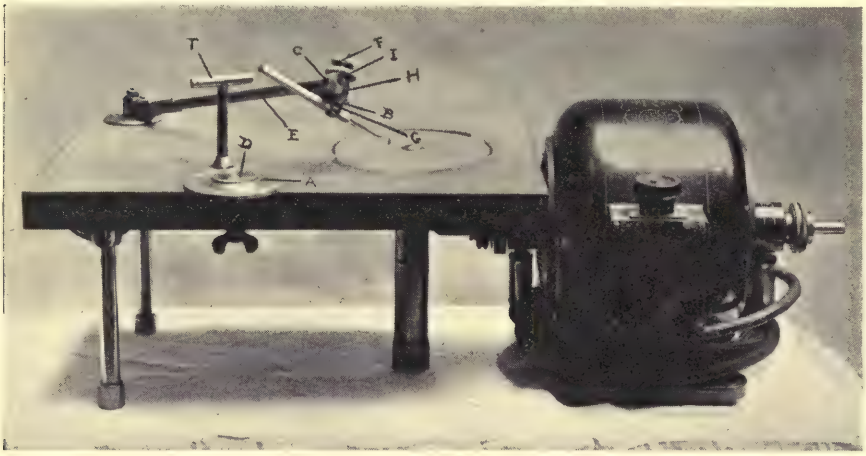


Fig. 1.

with the face on which it is operating, it is not a cutting tool, but a scrape." This is generally the position of the hoes.

Owing to the fact that an instrument is not held in the same relation to the work at all times, the question of clearance and cutting angle will not be considered. Back slope and side slope do not enter into the construction of dental instruments.

The appliance shown has been devised to overcome some of the difficulties and to produce reasonably accurate results. If our instruments were of one shape the problem of a holding appliance would not amount to much, but with the variety of shapes, angles of the cutting edge in relation to the handles, and size of handles, a holding instrument must be capable of being adjusted to almost any position.

The results of the measurements of new instruments were so unsatisfactory that little attention has been paid to the satements of the manufacturers, except to that of the company admitting that they did not know, though in justice to that firm enough of their instruments were not available to get a fair estimate on them.

Barring further experimentation on the lip-angle, the solution seems

to hinge on a holding instrument that will almost automatically supply the deficiency in the ability of most of us to obtain uniform lip-angle with the proper relation of the cutting edge to the shank in each class. The appliance presented makes it possible to use some definite angle which may be approximately correct and produce it with an edge which is straight and at the proper relation to the shank of the instrument.

The illustrations show the construction. The stone is Arkansas.

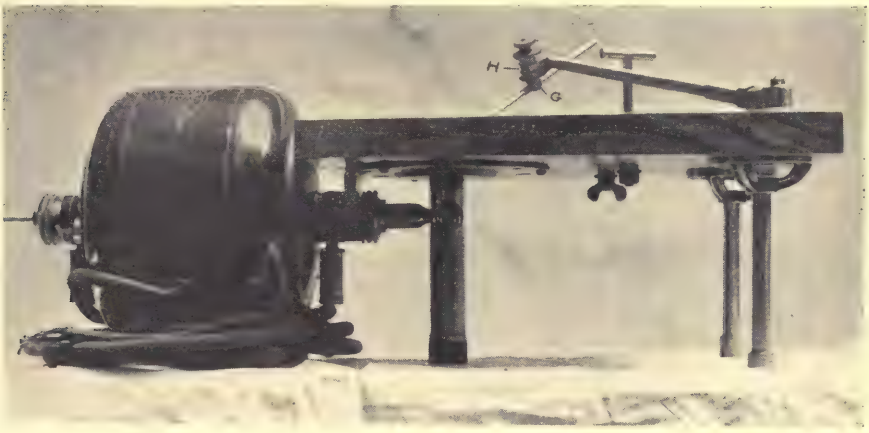


Fig. 2

Instruments are set up from a list on which is the name, number or formula of each, and numbers from the graduated scales A, B and C. (The gradations and numbers are too small to show.) This list was obtained by setting each instrument in its proper position on the stone and recording the numbers opposite the indicators on the scales mentioned.

The guide D is set, locked with the swing nut and arm E placed on the rest T; the instrument is slipped into the holder as shown and into the slot in the guide (too narrow to show in the illustration) and locked in the holder by nut F, preventing it from turning on its long axis or from slipping. It is still free to turn, parallel with the arm in the sleeve G (scale B is on G), and at right angles to the arm, in the clamp H. (See G and H, Fig. 2.) The sleeve and the clamp are set at the proper numbers, both locked with the nut I, and the arm swung over to the stone. The arm can be raised at any time to examine the edge.

This paper has been prepared and presented because of the possibility that some operators may be encouraged to use sharp hand instruments more and the engine less, to obtain better results in less time and with less discomfort to the patient.

References:

S. S. White Dental Manufacturing Co.
Cleveland Dental Manufacturing Co.
L. J. Mason.
Cleveland Twist Drill Co.
Browne & Sharp.
Reference Bureau of Nelson's Encyclopedia.
Mr. J. H. Dennis, tool maker of the Southern Pacific Company's shops.
Mr. Valdemar Arntzen, Mechanical Expert University of California.
Mechanical Engineers' Pocket Book—Kent.
Machinery's Hand Book.
On the Art of Cutting Metals—Taylor.
American Machinist's Hand Book—Calvin and Stanley.
Hand Book of Small Tools—Oberg.
Tools for Engineers and Woodcutters—Horner.
Milling Cutters and Their Efficiency—DeLeew. From Transactions of American Society of Medical Engineers, Vol. 33.
Operative Dentistry, Vol. 2—Black.

Papers Read in Section IX.

Prosthesis

Chairman's Address.

By Ellison Hillyer, D.D.S., Sc.D., Chairman.

The keen observer of progress will inevitably note the tendency on the part of its sane supporters to proceed conservatively. Undue haste has its usual sequence either of failure or but partial success. Conscientious, thoughtful preparation for definite forward movement is as essential to the success of an undertaking as the actual carrying out of the movement itself. Hence the progress which we have already made and are looking forward to accomplishing has had its inception in the individual; then, by association, in our local societies and study clubs, our State and National organizations, culminating in such a gathering as this of the Panama-Pacific Dental Congress, where are convened the most earnest exponents of dental progress with but the one object in view of doing whatever may be possible to focus the results of the successes and failures of the past in such a manner as to give the profession of dentistry a succinct view of these successes and failures, point out the new departures, indicate the dangerous results of some past practices and in the end raise up a definite standard for us to uphold in the future.

Dental Prosthesis.

This will be true in every section of the Congress. Contemplating our own subject of dental prosthesis, we have much to regard with satisfaction and much with regret. The progress shown in the taking of impressions, the anatomical articulation and artistic treatment of porcelain teeth calls forth our warmest commendation. The lack of development in some other departments of the field of prosthodontia calls for our just criticism, inciting us to such efforts as shall make for marked improvement. By criticism I infer that it shall be of the *constructive* and not the *destructive* character. Many are prone to criticize merely, with no thought or suggestion of correction. Let our criticisms, when offered, be supplemented with suggestions for remedies.

It is not my purpose to elaborate upon the program prepared for you. This will be left for each essayist and clinician to do in his own way. The officers of the section, in harmony with the officers of organization

of the Congress have unceasingly, since their appointment, striven to prepare this program. The various essayists and clinicians have spared no effort in bringing to you that which will be presented. It now remains for us to tender to all our sincere thanks for their efforts on our behalf and to bespeak for all who will take part, the utmost consideration.

The authorities of the Congress have adopted some very stringent rules of procedure, which include the limiting of both essayist and discussor to a given time. Much doubt has been aroused as to the possibility of its rigid enforcement. I trust I may not be accused of "inciting to riot" when I say that in my capacity as presiding officer of this section I feel that some latitude must be allowed me in the admission of the full presentation of *that which is vital to the full success of a discussion.*

Let us, however, be mindful of the fact that much ground must be covered, full justice must be accorded, all who will participate and, with these considerations in mind, keep strictly to the subject under consideration, thus conserving time, energy and patience.

Mechanical Correction of Cleft Palate.

By Calvin S. Case, M.D., D.D.S.,

The new form of obturator,—which Dr. Brophy has somewhat appropriately spoken of as "the floating palate,"—for correcting the speech of congenital cleft palate patients, was first introduced at the National Dental Association of America in 1902. Its gradual development up to its present high state of perfection has been fully described in dental journals and in the proceedings of the International Dental Congresses of 1904 and 1914.

All who have had much experience in the correction of this deformity have recognized the importance of producing a condition, by surgical or artificial means, which will take the place and perform the functions of the normal velum palati.

Functions of the Velum Palati

The most important of these functions is the involuntary ability to completely close the air passage to the nose, which in the relaxed state is open for free breathing, and yet in the perfect utterance of all the oral elements of the vowels and consonants, except m, n, and ng, this closure is absolutely necessary. The object of this complete closure of the naso-pharyngeal passage is to enable the vibratory air blasts, after leaving the vocal chords, to be wholly and forcibly directed into and through the oral cavity, where they are moulded into speech by the action of the tongue, the palate, the teeth, the lips, and in fact all the muscles which have the power to change the size and form of this wonderful channel in which the finishing touches of perfect speech are given. Another important requirement is a sensitively free mobility of the veil which will quickly respond to the rapid muscular movements required in speech, even to the extent of a vibratory activity which is necessary for perfect resonance.

The quality of voice known as resonance is quite as important as perfect enunciation, and bears the same relation to the mechanism of speech as the resonating quality and volume of tone bears to the character of musical instruments. When the normal velum palati is stretched out

to a thin drum like tenseness in the performance of its function of closing the palato-pharyngeal passage it becomes a perfect transmitter of voice vibrations to the true resonating chambers of the head. Moreover the veil of the normal palate in this important act, extending almost directly backward from the hard palate to meet the superior pharyngeal muscle, places it at nearly right angles to the voice blasts, and consequently in a favorable position to directly receive and transmit their vibratory activities.

It will be seen therefore, that this peculiar transmitting quality of the velum palati is of the greatest importance when we realize that in nearly all parts of speech not a particle of the vibratory air itself can be allowed to pass into the nasal chambers, as it not only impairs the tone, changing it to a nasal quality, but mainly because it diminishes the power necessary to send the voice blasts into the oral cavity with sufficient force to distinctly enunciate the explosive and aspirate elements of speech. For instance in the sharp distinct utterance of the explosive oral elements of b, d, t, etc., there must be a compressed accumulation of air back of full stops with a sudden explosive emission as in pronouncing, *boy, toy, do,* etc. Again in the distinct utterance of the aspirate oral elements, s, sh, ch, etc., the air must be forcibly expelled through constricted openings with a sibilant or aspirate forcible breath sound, as in pronouncing the words *see, shame, chuch,* etc.*

Defective Results of Surgical Operations

These requirements are inadequately fulfilled by all surgical operations which merely unite—however perfectly—the borders of the cleft in the hard and soft palate, because of the more or less wide naso-pharyngeal passage which it is impossible for the muscles to close. Nor are these requirements wholly fulfilled by many of the more extensive operations which leave a large amount of tense cicatricial tissue stretched across from throatwise lateral attachments, because of the opening which it is still impossible to entirely close, and the lack of that free rapid mobility of action so necessary in the mechanism of speech.

Moreover the slant-wise position of these surgically extended veils is hardly in accord with nature's method of placing the normal veils, which in action is at right angles to the vibratory voice blasts; and this

*A more extensive description of this branch of the subject in relation to the speaking capabilities of cleft palate patients, and methods to be employed in teaching them how to talk, together with a complete description of the technic construction of the Velum Obturator, will be found, extensively illustrated, in an unabridged treatise upon the Mechanical Correction of Cleft Palate, published by P. Blakiston's Son & Co., Philadelphia.

may be one of the reasons why true resonating voice quality does not always obtain from these operations even when capable of completely closing the palato-pharyngeal passage.

Defects of Other Artificial Palates

With nearly all forms of obturators and artificial palates, these requirements have rarely if ever reached fulfilment, because of their rigidity and cumbersomeness, and the need of attaching them,—more or less immovably—to a plate or dental fixture, which prevented that sensitive adaptability and adjustment, and that activity of movement, so necessary to perfect speech.

It was this freedom of movement of the veil of the "Kingsley Velum" which made it so successful for the acquirement of speech, and were it not for its failure to meet other equally important requirements, the Kingsley palate would stand to-day as the *ne plus ultra* of all artificial palate work.

Advantages of Case Velum Obturator

One of the most important peculiarities of the present velum obturator, and the one which places it on a scientific basis in its relation to all the requirements of articulation and resonance, is the feature that—in its typical state—it does not require any attachment to plates or other dental devices to hold it in position, being sustained purely through its perfectly fitted nasal and palatal extensions, and the peculiar form and position of the veil in relation to the walls of the pharynx and action of the pharyngeal and palatal muscles.

The importance of the non-necessity of a supporting plate therefore, is not merely one of convenience to the patient, to say nothing of the injury to the teeth occasioned by clasps, and the unhealthfulness of the tissues caused by any form of partial plate, but it is because this seems to be the one lacking principle which has placed the mechanical correction of cleft palate upon a basis which permits a close imitation of the activities of the natural velum palati, enabling the acquirement of distinct articulation and resonance of perfect speech. The secret of this accomplishment lies first in obtaining an adequate impression, and second in the free hand forming and adjustment of the model of the veil of the palate to the walls of the pharynx and to the action of the pharyngeal and palatal muscles. It is aided moreover by the exceedingly light weight of the palates, made possible with hard black vulcanite finished to the minimum of material for form and strength, which doubtless is a potent factor toward permitting that desirable quick cooperation with muscular speaking action which renders it immediately responsive to the slightest

movement of the muscles which hold it in their grasp, thus producing a close imitation of normal activities.

It will be observed also that its thin wafer-like central portion or "diaphragm of the palate" takes the same position in relation to the direction of vibratory voice blasts as does the normal veil; and this may be one of the reasons, if not the main reason, that has led eminent surgeons

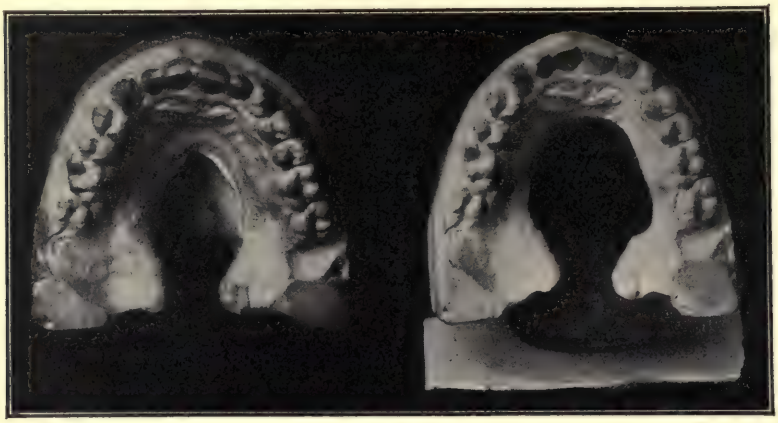


Fig. 1.

to note the perfect resonating quality of the voice in this method of treatment, and its possible superiority, in this particular, over the average surgical operation.

Retention of the Velum Obturator

Soon after the first employment of this peculiar form of obturator, it was a surprise and pleasure to find that a large proportion of patients whose clefts extended into or through the hard palate soon learned to do without the supporting plate. (Fig 1). For several years this was attributed to the favorable form of the cleft and the perfect impressions obtained of the floor and lateral borders of the nares; and an endeavor also to take advantage of every irregularity or indentation into which this portion was made to exactly fit, and thus prevent its backward movement. Later it was found that while these features are desirable, they are only aids to the real secret which holds the velum obturators safely in place without a supporting plate; and that the main sustaining force which seems to effectually prevent them from slipping back or down into the throat in any position of the head during waking or sleeping hours, is the exactness in the form and relations of the veil, and its immediate response to the slightest functional action of the palatal and pharyngeal muscles.

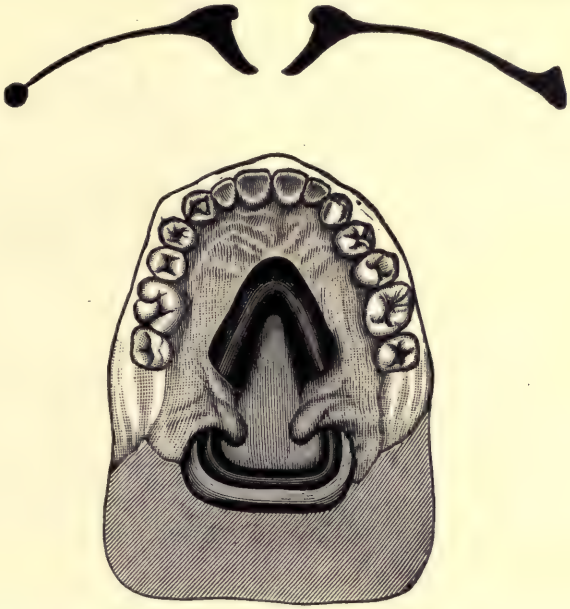


Fig. 2.

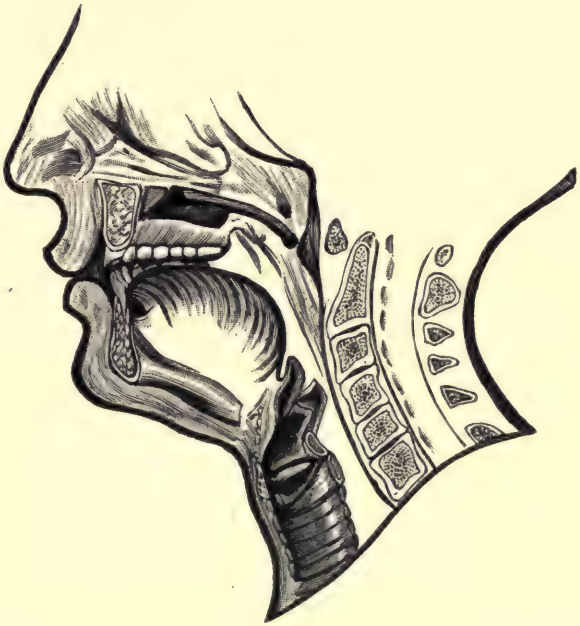


Fig. 3.

As one of the normal involuntary functions of the throat muscles is to guard the portal of the throat in the same way, that the epiglottis and eyelids guard their portals, they seemingly learn quickly to detect the slightest backward movement of the obturator, and when this consciously or unconsciously occurs, the muscles involuntarily force it back to position. In fact it is only during a full relaxation of the muscles that the velum obturators can be removed, though patients soon learn to control the sensitive contraction of the muscles and easily remove and replace them for cleansing, etc. The space around the borders of the veil, in a relaxed state of the muscles for free breathing, should ultimately be fully as wide as it is possible for the surrounding muscles to completely close. (Fig 2). The posterior borders of the veil also should be slightly above the greatest extension of the pharyngeal muscles, and consequently above all the swallowing muscles of the throat, so that the veil of the palate is never allowed to come within the grasp of these muscles in such a manner to be forced down and backward, but always up and forward. (Fig. 3). This doubtless is the reason why the velum obturators are worn securely without a dental attachment and with such perfect unconsciousness of their presence in the mouth.

Successful Use of Velum Obturators

Many patients wearing the velum obturators have been examined by the most prominent surgeons and dentists of Chicago, and exhibited at a number of prominent meetings. The following is an extract from a letter addressed to the author by Dr. John B. Murphy after an examination of one of these patients: "Your patient not only spoke well, with perfect enunciation and tone, but seemed to be unconscious of the palate in her mouth, in any position of the head. And though not attached to a dental plate which I had supposed was always necessary, it seemed to rest securely in position, responding in every detail to movements of the muscles of speech, deglutition, and inhalation, just as though it were the natural palate and velum. Its motion really seems uncanny it is so natural."

Later Dr. Murphy saw two other patients with the same character of commendation.

At the Jubilee Clinic of the Chicago Dental Society in 1914, three other patients were exhibited; all of whom had worn velum-obturators for years. The large number who examined these patients and who had not previously seen the obturators in action, were not only surprised at the perfection of speech which they enabled, but astonished to find that they required no supporting appliances or plate, while freely

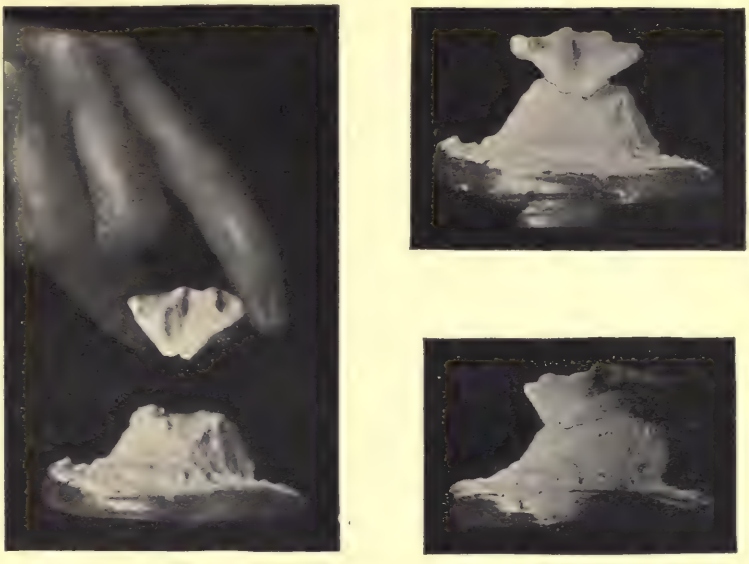


Fig. 4.

Fig. 5.

Fig. 6.

responding to movements of the muscles in the act of swallowing and in speech.*

At the 1915 anniversay clinic of the Chicago Dental Society, Dr. Thos. L. Gilmer, a surgeon of well-known renown, and professor of oral surgery in the N. W. U. Dental School, paid the following very high compliment to the Velum Obturator: "Your patients speak more perfectly in tone

Fig. 7.

and articulation than we ever accomplish by the surgical method of correcting cleft palate when operated on after five years of age."

Of the many cases under twenty-five years of age for whom this form of artificial palate has been inserted by the author within the past thirteen years, nearly everyone, after a year of faithful practice, speaks so perfectly, that his deformity is rarely suspected. Two of these patients, while being able to distinctly enunciate every syllable, retain a nasal tone with a lack of resonating quality which is no doubt due to previous surgical operations which nearly destroyed the functional possibilities of the palatal muscles to properly work the artificial vela.

*Of the many who have seen the Velum Obturators in practical action, the author is pleased to mention the following well-known names: Drs. T. W. Brophy, R. Ottolengui, C. N. Johnson, Hart J. Goslee, E. Noyes, John P. Buckley, J. E. Keefe, W. H. G. Logan, Thos. L. Gilmer and J. H. Prothero.

Fig. 4 is made from a typical two-section impression.

Fig. 5 is a remarkable two-section impression.

Fig. 6 is a typical three-section impression.

Fig. 7 are three views of two typical obturators, to show the common overhang of the nasal extensions.

Complications with Irregularities and Surgical Failures.

With all extensive congenital clefts, and especially those which completely separate the maxillæ, there commonly arises, through a lack of normal development, abnormalities of the upper jaw and denture. These conditions are frequently of such a serious character, that their correction should precede the insertion of an obturator, or any form of operation for the correction of speech which is performed after ten or twelve years of age, if one hopes to obtain a result that will enable the patient to acquire perfect articulation, to say nothing of the desirability and advantage of correcting decided facial deformities.

For the many patients with irregularities of this character who receive surgical treatment with no attention given to this important part of the operation, there can be little hope that perfect speech will be acquired. Moreover a number of cases have come under my observation where the operation itself aborted the possibilities of acquiring perfect speech by the forcing of the maxillæ together during infancy to close wide open clefts, causing the buccal teeth to erupt within the dome of the arch, where they not only interfered with the tongue in its enunciatory action but deprived it of one of its most important supports in preventing the escape of air into the buccal channels in the utterance of nearly all the consonant oral elements.

The principal irregularities which accompany extensive clefts whose correction should be considered an imperative part of the operation are: (1) General inhibited development of the maxillæ due to imperfect functioning of the masticating and nasal breathing apparatus. (2) Decided dental malpositions due to abnormal eruptions of the upper front teeth, with almost invariable diagonal impactions along the borders of complete single and double clefts. (3) Loss of the entire intermaxillary or incisive process and incisor teeth due to surgical malpractice followed by the closing up of the cleft in front with consequent retraction and retrusion of the anterior arch and upper lip causing not only a decided facial deformity, but preventing the normal coaptation of the lips, the tongue and teeth which are necessary in distinct articulation.

In a very large proportion of all extensive clefts, the lower front teeth close in front of the abnormal alignment and retrusion of the uppers,

and when this is accompanied with a cicatricially contracted upper lip with those frequently seen inverted V shaped fissures, and with an involvement of an abnormality in the form of the nose, we are confronted with not only one of the most pronounced facial deformities, but with a condition of the jaws and teeth that demand correcting as an imperative part of the correction of speech.

Imperfect surgical operations on the upper lip leaving the patient with V shaped fissures and an excess of cicatricial tissue, may be corrected later by skilful surgeons, with the view of straightening the lower border of the lip, and giving to it a greater freedom and mobility of action.

Labial explosives as bŭ, in boy, etc, demand, in the highest acquirement of distinct enunciation, a perfect closure of the lips, which is impossible if there is the slightest opening through which the compressed breath can escape. **Labio,** and **linguo-dentals,** as **vŭ in vain, fŭ in fall,** and **thŭ in those,** etc; require an even line of occlusal edges of the front upper teeth. The anterior **linguo-palatals,** both **explosives** and **aspirates,** in words containing the oral elements, **tŭ, dŭ, chŭ, s, z,** and **sh,** cannot be perfectly uttered without an occluding surface for the blade of the tongue, which resembles in its form the anterior linguo-palatal ridge.

In extensive cases it is rare to find the full complement of teeth, impacted or otherwise, the germs being extinct or having been destroyed. In two instances in the author's practice the incisors and the intermaxillary-process were missing, which was doubtless caused by the surgeon who operated on the lip in early infancy not understanding that the nodular fleshy process hanging at the tip end of the nose at birth, with infants having double clefts and hare-lips, contains the germs of a most important part of dental and facial anatomy. Believing it to be a useless abnormal appendage, these "pseudo surgeons" heedlessly snip it off, oblivious of the fact that they are depriving the patient's future, of the main portion of the upper lip, all the upper incisor teeth, the entire intermaxillary process with its nasal spine and cartilage which supports the upper lip, the end of the nose, and muscular portion of the nasal septum.

Even with extensive single complete clefts through the maxillæ, some of the front teeth are commonly missing, others are frequently deformed, decidedly malposed, or deeply impacted, so that orthodontic and prosthodontic operations are demanded if one aspires to accomplish a perfect correction. If, in these cases, it seems necessary to sustain the artificial palate with a plate—which is now rare in this stage of our advancement—a gold plate denture may be constructed with a pink rubber attachment to restore the facial contour and fill the anterior portion of the cleft. But a removable bridge denture with porcelain restorations is

Fig. 8.

Fig. 9.

preferable by far. It is nearly always advisable in these cases first to correct the positions of the remaining teeth and widen the arches. In wide open clefts at birth, the space in front will usually be found closed at ten years of age, however much the jaw may be deprived of front teeth and intermaxillary processes. This extensive settling together of the two lateral sections of the maxilla, mainly through the force of the action of contracted lips, is the principal cause of the decided upper retrusions which are so often found in these cases.

Besides correcting the alignment of the remaining teeth, the restoration of impacted teeth, and the extraction of deformed teeth, the cleft maxillæ should be widened to restore the parts to their normal positions, in order to place the buccal teeth in masticating occlusion with the lowers and to round out the arch for the proper placing of the artificial denture and restoration auxiliaries. The extensive lateral expansion of the arch will of course widen the cleft, but that is a matter of no moment so far as the fitting and action of the obturator is concerned, while the cleft forward of it can be quite as easily and properly closed.

The strong tendency of the widened arch and cleft to go back to its former position, demands a firmly attached retainer bridge. If a removable bridge is employed, it must be of that construction which will effectually prevent this possibility. There is such a variety of conditions that may present that no rules can be laid down, as much will depend upon the ingenuity and skill of the operator.

Fig. 8 is made from the casts of a Miss, commencing at fifteen years of age, in which an original wide double cleft had become closed in front so that the right cuspid nearly touched the opposite second bicuspid. The intermaxillary process, and all the incisor teeth and the left cuspid and first bicuspid were missing, probably due to the first surgical operation, to close the cleft through the lip. In observing the decidedly retruded position of the dental arch and upper lip in relation to the lower denture and lip, one can imagine something of the difficulties of acquiring perfect speech even with the best of palates. On the right will be seen the expanded arch which placed the buccal teeth in masticating occlusal relations, preparatory to constructing the bridge denture shown below.

Fig. 9 shows the three stages of the facial outline. The one on the left was made from a plaster cast of the face before treatment. Next to this is shown the appearance after the dental correction, and the one on the right after the further surgical correction on the upper lip and nose, which was performed by Dr. L. L. McArthur of Chicago.

With the restoration of the facial outlines and functions of mastication, and with a velum obturator which enables her to speak with perfect

articulation and tone, this now quite attractive-looking young woman is a useful and happy member of society, endowed with all the possibilities which make life worth the living. To one who has accomplished a single result of this character, the fee, be it little or much is nothing, compared with the great satisfaction of knowing that you have been instrumental in

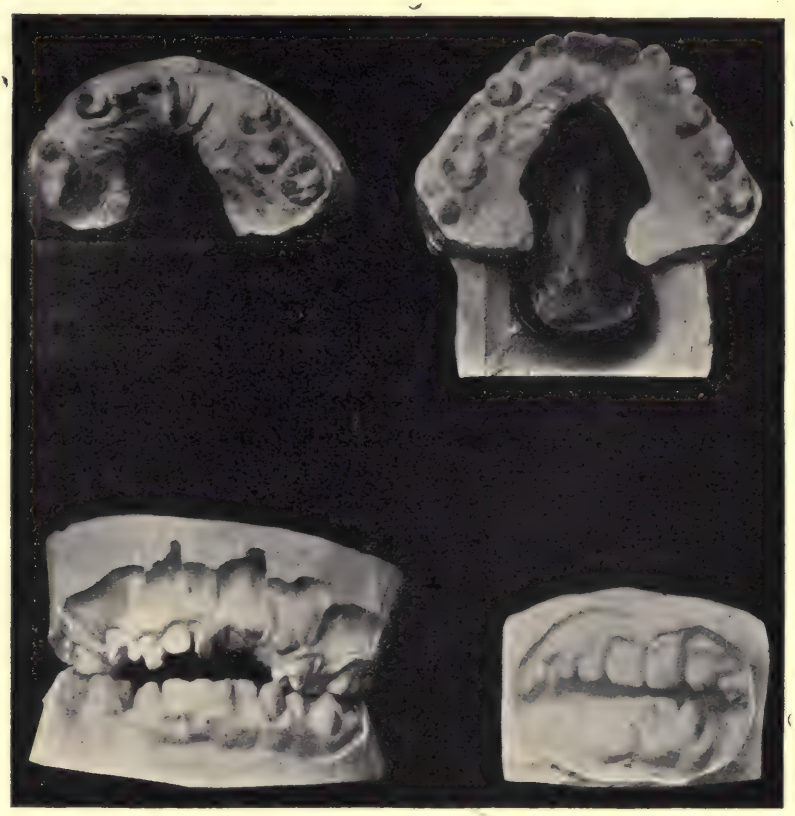


Fig. 10.

restoring to physical, social, and intellectual manhood or womanhood, a deformed human being whose life otherwise would have been a constant embarrassment, a humiliation and a burden.

Fig. 10 is made from the plaster casts of a boy commencing at fourteen years of age. His upper central incisors besides being decidedly retruded and malturned, were almost wholly buried under the gums. The right cuspid was impacted and the left cuspid just pricking through the gum, was in decided mesial inclination. The width of the arch in the

buccal area placed the molars in extreme buccal malrelations to the lowers. In fact there were only two points where his teeth touched in occlusion. The cleft was unusually large and wide, partly due to loss of natural tissue in frantic and futile surgical operations to close it during infancy. His speech was so imperfect, because of his extensive palatal and dental deformity, it greatly hindered him at school and when ever he attempted to talk to strangers. And yet he was a boy of more than usual intelligence and brightness, just arriving at the age when he was beginning to appreciate his condition, and feel intensely the humiliating and depressing forces of his misfortune.

His impression for the obturator was delayed until the positions of the teeth were nearly corrected as shown by models on the right where is also shown his obturator in position. It was necessary to take the impression in three sections, in this case as will be described at my clinic. Fig. 6 shows his impression, which was photographed before filling for the working model. The first obturator was of flexible rubber, but before the close of the day a hard polished rubber obturator was inserted which remained in his mouth during that first night, and every night since, without a retaining plate. This patient was presented at the November, 1914 meeting of the Odontological Society of Chicago about two weeks after the first insertion of his obturator and even at that early stage he could perfectly articulate nearly all the oral elements of speech, when pronounced for him separately, and most of the single syllable words that are difficult for cleft palate patients to utter.

His mother writes me (Feb. 25, 1915) that he is now taking his place in his school classes with the greatest satisfaction to his teachers and friends, speaking nearly all his words with quite distinct articulation, except when he forgets himself and speaks rapidly. It will not be many months before he completely corrects these former habits of speech. With this change and its possibilities in his speech and voice, there has come into his countenance that happy animated expression of boyhood, which is fast taking the place of the former dull look of despair.

Surgical Failures in Operation on the Cleft.

One of the most difficult and at times discouraging conditions which confronts the specialist in the mechanical treatment of cleft palate, is the appeal for help from those whose clefts have been partially or completely closed by imperfect or inadequate surgical operations, which leaves them without the possibility of ever perfecting their speech unless something else can be accomplished.

It is a mistaken idea among surgeons that an equally useful artificial

palate can always be constructed after surgical operations prove failures. For even in those cases where they have not succeeded in uniting any portion of the cleft, much will depend upon the amount of scar tissue that is left, which will invariably inhibit, to that extent, the free functional mobility of the palatal muscles upon which the obturator must always rely for its perfect action.

A not uncommon form of surgical failure, and one which is more

Fig. 11.

unfortunate than no surgical union, is where the patient is left with a partial closure of the cleft,—generally through the velum,—the history of which usually indicates that the surgeon was unable, by repeated trials, to close the cleft through the hard palate. On the other hand many operations are performed upon extensive clefts with the view of closing *only* the soft palatal cleft, in the apparent belief that when the cleft through the hard palate is closed with an artificial plate, which any dentist can construct, the patient will speak more intelligibly and thus will have received the best that can be accomplished. The argument will apply here that has been mentioned in reference to all surgically or artificially corrected palates that are decidedly inadequate for closing the palato-pharyngeal passage.

The most unfortunate feature in regard to these partially closed clefts are, that few patients are willing to have them disunited for the

insertion of an obturator, even though there may be through this means a fair promise of all the possibilities of perfect speech. One patient over twenty-five years of age with a large cleft, and with only a small part of the soft palate surgically united, after trying for more than a year to persuade me to make some kind of an artificial palate in that state, finally consented to permit the severing of the slight union, his conclusion being due to a favorable decree of an "Oracle" which he said he consulted. This man who was a foreman in a large machine shop, and quite well educated,

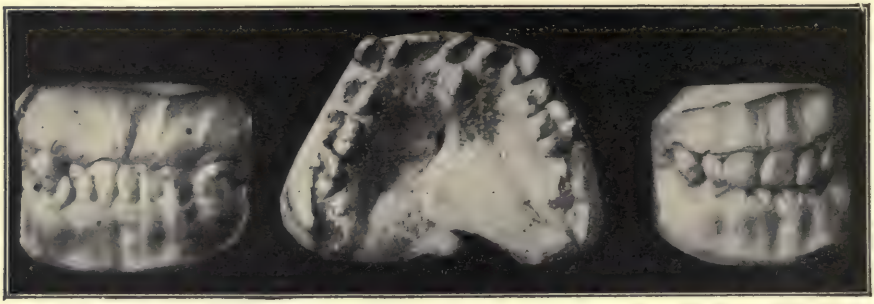


Fig. 12.

learned to speak so perfectly with an artificial palate, that he had evening classes for teaching the foreigners of the shop to speak English correctly. Who can deny that "Oracles" are of some use.

Fig. 11 shows the models and obturator of a boy thirteen years of age whose soft palate, when presented, was surgically united and, though the opening through the hard palate was closed with a plate, his speech was quite as imperfect as any patient with an open cleft. The correction of his speech would have been impossible without the preliminary correction of his teeth, the expansion of the arch, and the insertion of the bridge denture, which also corrected a decided facial deformity.

A far more unfortunate finale is where patients are left with a complete surgically closed cleft, but with the velum palati so inadequate in its length and possibilities of functional action that they never can be able to close the palato-pharyngeal passage and consequently can never be able to speak perfectly. Many of these results, when considered from a surgical standpoint are worthy of being classed among operations of the very highest order, demanding a degree of consummate skill and ingenuity in not only closing extensive clefts, but in lengthening the soft palatal tissues in a maner that is truly wonderful. In the most skilful operations of this character, performed during late childhood, vocal articulation,

though frequently quite perfect, is almost invariably lacking in tone and resonance; the speech being characterized by the peculiar nasal or "cleft palate quality." Had the same skill been employed in early infancy it undoubtedly would have resulted in perfect success in every particular, and when results of this high order *are* obtained surgically there is no doubt of their superiority over the mechanical method. It is a deplorable fact however, that the larger number of surgical operations, even to-day, are of a lower order, and that there are so many cleft palate operations attempted at all ages and upon all sizes of clefts, often with no effort or expectation of doing more than to barely unite the borders of the cleft. Even the supposedly successful cases, where the clefts have been completely united with results which debar the patient from acquiring perfect speech, they are particularly unfortunate, because it is a rarity when they or their friends will consent to the destruction of the surgical union which has been attained through such incalculable hardships. Nor could they be assured, under the circumstances, that the usual perfect result of the mechanical treatment would be attained.

Fig. 12 was made from the models of a man over twenty-five years of age. It will serve to illustrate the not uncommon appearance of a surgical closure of a cleft. The distance from the posterior border of the velum palati to the nearest extended position of the posterior pharyngeal wall, was fully three-fourths of an inch, and consequently his speech had all the imperfect characteristics of open cleft palates. The cleft was opened as shown, followed with the insertion of a flexible Kingsley velum; and while the result was far from perfect, his speech and voice tone was considerably improved. This was before the days of the velum obturator which doubtless would have been far more successful.

The case is presented here principally to show the common condition of the teeth in connection with extensive clefts, and what may be accomplished in their correction at quite an advanced age. The impression for the final palatal view was taken with the retaining appliance in position.

While it is true that a very large proportion of cleft palate patients who have received unsatisfactory surgical treatment, are unwilling to try what they believe to be "another experiment" and especially those who have obtained a complete and even partial closure of the cleft, it happens to be true also that nearly one-half of the many patients for whom the author has inserted artificial palates, have at times during earlier life—mostly during infancy—received surgical treatment for the correction of their cleft palates.

Let us hope that the proportion of surgical failures will be greatly

lessened in the future, and that the operation for cleft palate, which each year is advancing to a higher standard of skill and efficiency, will be confined to the hands of those able and honest surgeons who will not undertake questionable cases merely for the fee or some clinical exhibition, and whose principal field of operations in this line will be among infants for whom the earliest safe closure of a cleft palate—as has been published by the author for many years—should be considered absolutely imperative.

Impression Material and Impressions.

By George H. Wilson, D.D.S., Cleveland, Ohio.

A dental impression may be defined as: "A negative likeness of an object or part taken in a plastic material, from which a cast or positive likeness may be produced."

As the text-books treat fully of the materials with which impressions are taken, it is apropos only to consider them in a comparative sense.

Impression Materials.

There are two classes of materials used in taking impressions: First, materials made plastic by heat, and second, materials made plastic with water. This implies that the two classes have different physical properties. A class I material must expand in the ratio of its co-efficient of expansion and of the degrees of heat necessary to produce the required plasticity; and, as the material is made to adhere to the tray and does not adhere to the surface being impressed, the contraction resulting from the loss of heat while hardening must be toward the tray and away from the impressed surface; therefore, the intaglio of the impression must be as much larger than the model (jaw or part impressed) as is produced by the contraction of the material. A class II material expands upon crystallization, and as the tray is unyielding and the soft tissues compressible the intaglio of the crystallizing impression must be smaller than the model. Therefore it is a logical conclusion that the less bulk of either class of material used in taking an impression, the nearer will the cast be to an exact reproduction of the model. However, if the cast must be either larger or smaller than the model, it is better the latter, because of the closer adaptation of the completed denture.

It is true that the amount of contraction of the one and the amount of expansion of the other class is not very great, and that both may be largely overcome by proper manipulation; but it follows that there must be a definite technic for each so as to produce an impression that will form a cast suitable for its intended use.

If it is admitted that a perfect cast may be obtained from either class of impression materials, then the choice of material must be contingent

upon three factors: One, positiveness of results; two, ease of manipulation, and three, cost.

Positiveness of Results.

The material suitable for the first class are principally of organic substance and of a gummy or resinous nature, hard and brittle at ordinary temperature; but soft, pliable, very flexible and slightly elastic under moderate heat. The materials of the second class are of inorganic substance and are in a powdery condition until placed in water, when they become soft and very plastic, but soon crystallize into a hard, brittle, inflexible and non-elastic mass. Hence the working properties of the two classes are directly opposite to each other. This being true, it hardly seems possible that they can be equally valuable for impression taking. The requirements for an impression material are that it shall take and retain a sharp impression, also that it may be removed from the model without destroying the perfection of the imprint. The materials of both classes now in use may be considered as nearly equal in taking a sharp impression, but with that their likeness ceases. Many models (the model is that of which the impression is taken, for it is that which is to be reproduced in form) are of an inlocking form; and that implies that the impression taken must either flex or break, so that it can be removed. A material that is flexible and not equally elastic must be distorted when removed from an inlocking model. This is what must always take place with a gummy or resinous impression material used upon an inlocking model, for this class of material will not become friable while subjected to the temperature of the mouth. As no one can correct or even tell the exact limit of the distortion caused by the drawing of an inlocked model, the material is not positive in results; therefore, cannot perfectly answer to the requirements of a science. Whereas the materials of the second class are not flexible, but are fragile, and therefore cannot be distorted; but may be fractured, removed piecemeal and reassembled; hence, they are positive in their results. It is because of this tenacity of the material of the first class and the fragile nature of the material of the second class that the inexperienced and so many capable men discriminate in favor of a questionable material; whereas it should be the reason for its limited use only.

Ease of Manipulation.

One cannot consider that the ease of manipulation of a well-taken modeling compound impression is that which commends it; however, an indifferent semblance of an impression may be easily and quickly obtained and is very tempting to the inexperienced and the incompetent. It is granted that modeling compound is a valuable material and has its

uses, but it is not valuable for this reason: that is, the ease with which it may be abused. Plaster is easily manipulated because it can be accurately adjusted with one insertion, and its fragments can be readily assembled.

Cost.

The market cost of modeling compound should in no way militate against it; but the attempt to save a few cents by repeatedly using the material should be severely condemned in this day of asepsis. However, there is a cost item that is a serious one. When a plaster impression may be taken in one-fourth of the time required for an equally good modeling compound one, then the cost is exorbitant; for time is that for which the professional man demands his fee.

Reasons for Using Modeling Compound.

Why do so many men use modeling compound for impressions to the exclusion of plaster-of-Paris? There are two classes of men that do so. One class consists of the inexperienced and incompetent, and the other class of certain capable and competent men that have become enamored of a fad, a novelty, and are running wild. Of the first class we have nothing further to say, but of the second class we will ask these questions:

First: Why do you exclusively adopt modeling compound?

Second: Do you believe every dentist can manipulate compound successfully?

Third: Do you not know that there is much unconscious deception in impression-taking with compound?

A sincere and intelligent answer to these three questions will show one of two things, that the advocate is a hobbyist, or does not know of the faith that is within him.

Science of Retention of Dentures.

The whole object of a prosthetic impression is to secure a comfortable adaptation, a form favorable for esthetics and a suitable retention for an artificial denture. There are but two physical laws that have anything to do with this desirable property of retention. However, there are several conditions that aid or interfere with the efficiency of the two laws, as plate outline, size and form, condition of the soft tissues and fluids and tone of the system.

The two laws are molecular attraction and atmospheric pressure.

Molecular attraction is conditioned upon area and closeness of contact, and its lines of force are at right angles; laterally the force is nil. Therefore the material that will make the closest contact is the one that will create the strongest adhesion by molecular attraction. As modeling

compound is far more cohesive than a soft mix of plaster of Paris, it cannot possibly make as close a contact as the finely crystalline plaster. The amount of retention by molecular attraction in any given case will be dependent upon the area of the horizontal surface. If the vault is large and flat then molecular attraction is the best means of retention because the retention will be sufficient, and if attention has been given to secure uniform pressure the most comfortable retention will have been secured. If the vault is inverted V-shaped and the alveolar process is thin and prominent, then the retention by molecular attraction will be nil, because the surfaces are inclined planes and the weight of the denture is lateral to them; consequently, the retention in such a case must be obtained, if at all, by atmospheric pressure.

Atmospheric pressure is conditioned upon area and vacuity, and its lines of force are in every direction, so that the form is not a factor, as in molecular attraction. As atmospheric pressure is much greater than molecular attraction, it is very evident that all cases of excessive retention is largely by atmospheric pressure. It is certain that all those impressions taken by modeling compound, which are properly muscle trimmed and post-dammed and having great retention, consist of a rim of contact and an immense vacuum within. The space within is not apparent to the eye because it is exceedingly shallow, having been formed by manipulation and not by carving. A deep carved cavity would be detrimental to this strong retention because it cannot be sufficiently evacuated; whereas a properly muscle trimmed and post-dammed denture cannot be removed until a break is made in the peripheral continuity. Not until the valve is opened, if you please. With these strongly attached dentures there is always some place at which by lifting the lips and pressing the soft tissue so as to admit air the denture may be easily dislodged. Simply opening the valve.

Can all cases have this strong retention? Certainly not! One square inch of area will have a certain amount of retention, two square inches will have twice as much. Also the amount and health of the soft tissues are very important factors. A base-plate that rests upon a thin, tense, mucous membrane will have its valve or contact easily broken. If the same condition is accompanied with ill health (poor tonicity), then there may be no retention.

It is noticeable that the leading advocates of the cut and dry modeling compound method are not strongly advocating the original Greene method, which consists of completing the impression with a thin wash of plaster, which largely converted the denture into contact retention in place of vacuum retention.

Closed Mouth Method.

Much is claimed for taking the impression with the mouth closed. This sounds like sophistry, for certainly when the mouth is closed the dentures are held in place as in a clamp by the action of the powerful muscles of mastication, whereas when the mouth is open the denture is released from the clamp and may be acted upon by the muscles of the lips, cheeks, tongue and fauces. Therefore, the action of these muscles should be provided for while they are in an active state and not when inactive, that is, mouth closed; because at such a time their action is more than counteracted by the masticatory muscles.

A further claim for the closed mouth impression is that of equalized pressure. This is entirely unnecessary, for if this desirable quality is obtained it will be lost during the various procedures of construction of the denture. Equalizing the pressure should be attained as the final constructive procedure for the artificial denture. (Hall method.)

Furthermore, the muscle trimming method is destructive of esthetics. Its sole object is retention and requires the soft tissues to be so depressed that they are relieved of all stress, whereas esthetics require that certain soft tissues shall be bolstered.

There is another factor of technics that requires consideration, that is, the active assistance of the patient in muscle trimming. The success of the Greene method of modeling compound impressions is largely dependent upon the active assistance of the patient. This is no objection with many patients, because they will willingly, cheerfully and quickly follow instructions, but there are others who have little or no volition of the muscles about the mouth. Unfortunately, too many of the difficult cases are complicated with this inability to co-operate. Therefore, the method is not suitable for such cases.

Technic of Impression Taking.

As technic methods are also quite fully described in the text-books, it is necessary to consider them in a comparative sense only.

The dental profession owes Dr. J. W. Greene a debt of gratitude for his efforts in teaching better impression taking; however, it is unfortunate that his methods and teaching have been accompanied with so many objectionable factors. The two principles for which Dr. Greene's work is meritorious is impressing the fact of the perniciousness of distorted tissues; and of the necessity for obtaining a suitable peripheral adaptation. These two principles compose the meat of all his teachings. These principles should be adopted, and any method of impression taking used should include them.

The Greene method of impression taking consists of having a non-

interfering flange tray obtaining a well-adapted central portion with an indifferent periphery, which is adjusted by cutting away, penciling on, muscle-trimming and post-damming. This requires inserting and adjusting the impression many times.

A properly taken plaster impression consists of having a non-interfering flange tray, building up with wax and adjusting such portions for the peripheral border as may be necessary to meet the requirements, placing a sufficient quantity of thin mixed plaster, inserting, adjusting the muscles and making internal and external compressions. By this means a well-adapted and outlined peripheral border is obtained at the same time as a perfectly adapted central portion. Plaster is equally adaptable to undercuts and partial cases because it may be fractured and the fragments reassembled.

If dentistry is a profession, then its members should be scientists and not empirics. The scientist must thoroughly examine the case, diagnose and prognose, and not throw physics to the dogs. The empiric is satisfied that "pigs is pigs," cuts and dries, and is content to obtain strong suction if possible, which is his one goal and evidence of a suitable impression.

Should a scientific dentist ever use the Greene method for taking impression? Certainly he should; but he should at the same time have an inner consciousness that he is acknowledging his inefficiency. However, if he has properly diagnosed and prognosed the case, and has demonstrated that he is not able to meet the requirements by scientific methods, he is justified in experimenting with the cut and dry method, and should he be successful, then he and the patent may be thankful. The method certainly has its uses, but that use is not to supersede simpler, more positive and scientific ones.

Resiliency as Opposed to Rigidity in Artificial Teeth.

By R. Morse Withycombe, D.D.S., Sydney, New South Wales.

I have been experimenting continuously during the past three and a half years, hoping to produce an artificial tooth structure which shall be both resilient and aseptic, and I am now in a position to give the result of my efforts to the profession.

The idea of resiliency in connection with an artificial tooth appeals irresistibly to the average mind as a shock-saver, but to the scientific mind also as a means whereby we may (in conjunction with the splendid moulds which are now available) hope to obtain an artificial tooth which shall be capable of closely imitating Nature in the mastication of food. In the adaptation of artificial dentures to the human mouth it is necessary to relieve the tremendous pressure of mastication, but much more so to enable the teeth to glide and grind and balance over one another whilst exerting a maximum pressure. My aim is to increase the power in the approximal relationship of artificial teeth by perfecting a system of individual resiliency.

Early experiments were made in my own mouth, and I soon discovered that the only practical medium of resiliency for this purpose was to be found in soft vulcanized rubber, and that it was necessary for its preservation to keep it in the dark and under continual pressure.

In the construction of the tooth I provide a metal socket to take the place of the natural bony socket and fit therein a porcelain tooth, so that it may have a limited range of movement in every direction; soft rubber is then packed through an orifice in the socket and vulcanized, after which it is evident that the rubber has swelled and baked into every crevice of the socket, exerting a powerful yet resilient pressure against the base of the porcelain tooth. We have now a socket and a cushion of soft, springy rubber, whereupon the tooth is so fitted that it moves slightly in each and every direction during mastication, thereby acting the part to an artificial tooth that the peridental membrane does to the natural tooth. In bridgework, by relieving the unnatural strain, resilient teeth will undoubtedly lengthen the life of the abutments. In dentures

they prevent inflammation and the consequent resorption of the alveolar process; also it will be found that the teeth of upper and lower dentures, in moving over each other, reproduce the movements of the natural teeth in their alveoli. This enables us to use teeth with deeper sulci and higher cusps, which means more power to seize and rend hard food-stuffs. With this method, the clacking noise which is often noticeable in wearing artificial dentures is avoided.

Soft Rubber Sanitary.

It was with much anxiety that (after a fair trial in my own mouth) I first examined the surface of the rubber cushion which comes in contact with the base of the porcelain tooth. Upon removing the tooth from its bed, it was immediately apparent that the continual pressure of the rubber effectually barred the ingress of oral secretions.

I had private bacteriological examination made of the rubber, both on agar slopes and in bouillon, and found it to be in an absolutely sterile condition. Before leaving Australia, I approached a leading Sydney bacteriologist with a view of obtaining a public report for presentation to this Congress. I chose for this purpose a denture which I had worn for three years. It had three teeth, one of which was three years old, a second two years and the third six months; therefore offering a very fair test against time.

I will now read the bacteriologist report:

The Erlich Pathological Laboratory,
183 Macquarie Street,
Sydney, Australia, July 9, 1915.

I have to report as follows in regard to the bacteriological tests you asked me to carry out:

I received direct from the mouth of Mr. Morse Withycombe a plate containing three teeth. The plate was washed in sterile normal saline and the teeth were very carefully broken out of their beds, which I found was composed of good red rubber. There was not the slightest odor to be detected.

I made inseminations onto agar slopes from the material left in the cavity from which the tooth had been broken and from the surface of the rubber bed.

After forty-eight hours all cultures remained sterile. This confirms what was obvious to the naked eye—that the teeth and rubber were in a sound aspetic condition.

Yours faithfully,

I. Frond. Flashman, M.D.

I have used these teeth freely in my practice for the past two years and have given them to many brother practitioners in Australia. They may prove an undoubted success in very many cases which had previously been considered hopeless, and they have saved me much time and worry in the successful adjustment of all dentures.

Finally, gentlemen, the claims for asepsis being fulfilled, we find the demands of Nature imperative for resiliency wherever heavy shock has to be resisted. The oak tree and even a rock must vibrate to the storm. and we know that the crushing blow of from two to three hundred pounds, which is exerted by the mandible in using the natural teeth, would soon cause lameness were it not for the resiliency which Nature has provided for each individual tooth.

I hope this idea of resiliency, as opposed to rigidity, in artificial teeth will appeal to you and will be freely discussed.

Home Made Interchangeable Teeth for Crown and Bridgework.

By Dr. Alexander Manhood, Santiago, Chili.

I will commence by stating that the indication for their use is the same as for Steele's, Phoenix or others when these cannot be obtained.

The teeth I propose to use are the ordinary ones intended for rubber or gold work, so long as they have platinum pins. Select size and shape according to the case and grind to fit. Then we make for each one a trapezoidal backing and a slot box to fit it.

The trapezodial backing is made out of gold clasp plate of twenty thickness standard gauge. We cut a rectangular piece, Fig. 1, a little broader than the diameter of the pins of the facing, punch it to let them pass, place in a vise and file to a trapezoid shape; bevel mesial and distal angles which are to be in contact with porcelain, Fig. 2; place it on the facing and solder. We are now ready to make the slot box.

Slot Box. A rectangular piece of the same metal is taken and the center is cut out and then filed to fit the backing accurately, Fig. 3. Then another small rectangular piece is cut and put on the lingual side, Fig. 4, held in place with iron wire and soldered, Fig. 5, and cut off. The slot box is now ready, Fig. 6, and slipped on the facing and placed in its corresponding position on the cast. All the slot boxes are waxed together, the facings slipped off, invested, soldered, polished and cement facings in the ordinary manner.

Repairing. Several of these bridges are doing good service. Only in a single case was it necessary to repair a broken facing which was done in the following way: Bur vertically between the platinum pins till cement appears, Fig. 7, then take a pair of pliers and press pins together, which displaces the backing. Scratch off cement and fit new backing, Figs. 8 and 9. Cut off corresponding portion, place in the bridge and wax surface to be in contact with the porcelain. Place the new facing carefully where it corresponds so it will mark in the wax the position of the pins. Remove backing, punch, solder and finish in the ordinary way. Fig. 10 shows lingual view of such a bridge.

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

Fig. 5.

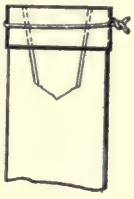


Fig. 6.

Fig. 7.

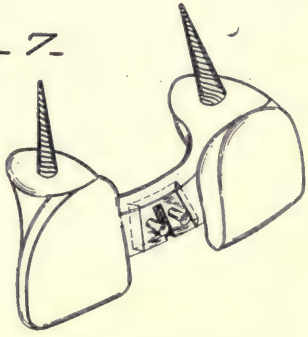
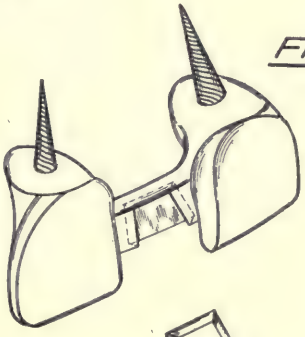


Fig. 8.



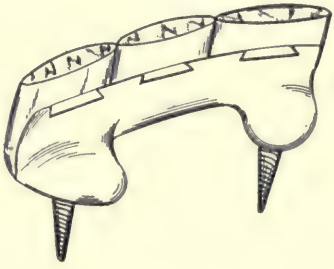


Fig. 10.

Fig. 9.

Simple Face Bow for Taking the Antero-Posterior Length of the Jaw.

By Dr. Alexander Manhood, Santiago, Chili.

After the works of Drs. Bonwill, Walker, Christensen, Snow, Gritman, Gysi, Amoedo, Valderrama, Frahm, Dalby, etc., I think nobody denies the importance of using scientific means in the construction of dentures for obtaining the length and width of the lower jaw.

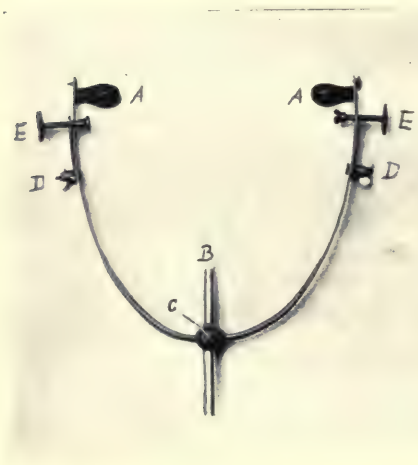


Fig. 1.

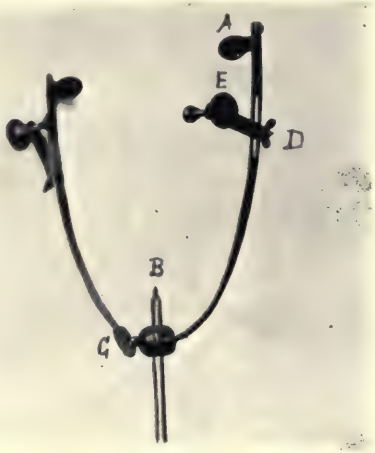


Fig. 2.

Everybody who has used Dr. Snow's face bow, knows how difficult it is to handle it properly without the aid of an assistant. Dr. Prothero recognized this difficulty and invented a most ingenious device to be used with Snow's face bow, but I think from making the bow too heavy has not come into general use. Dr. Kennedy, in the *Dental Cosmos*, of November, 1914, speaks of the use of an instrument called a "Face Bow Support," which has been recently designed by Dr. F. H. Brown of Lebanon, which represents the exact position of the condyle, eliminating guesswork.

The one I have the pleasure to present for your consideration is an

old friend, "Dr. Garretson Bow" for cases of protrusive chin, but with attachments for its new work. As you see at each end of the bow there is a rubber knob which fits in the ear passages, Fig. 1, A.A.; in the middle it has a hole with a screw to secure the rod, B. & C. Next we have the attachment which registers the position of the condyle to be transferred to the articulator, D. & H.

How to Use. Prepare articulating plates in the classical way, place in the mouth (be sure they are firmly waxed together), then place the rubber ends of the bow in the auditive passages; hold the head under your left arm and let the sides of the bow rest between your index and thumb of left hand, while same fingers keep lips separated. Now, with your right hand take the rod, heat and insert in the median line, between upper and lower plates, through hole in the bow, screw firmly bolt that holds the rod. Now we will adjust the attachment for the position of the condyles. Loosen bolt "D," Fig. 2 and let the arm slide or move in circular motion until it is in the place that represents the hinge of the jaw, then clamp bolt "D" firmly; do the same with the other side; now screw in knobs "E" until they touch the skin. Ask patient to open his mouth, remove bow from the ears by springing it open and place bow and trial plates in articulator, preferably Dr. Hall's.

Flat Jaws, Upper and Lower.

By Loomis P. Haskell, Chicago, Ill.

Of all the problems of the prosthodontist, none are more generally recognized than those of flat jaws, and especially, the lower.

I have had seventy years experience exclusively in plate work, and twelve years in using a flat denture in my own mouth; this has given me exceptional advantages, and I have learned things I could not have learned otherwise.

The flat upper jaw is considered by many dentists quite undesirable to handle and yet with myself it is simple. The important thing in these cases is the retention of upper dentures without air chambers to prevent plates resting and rocking over the hard palatal bone.

To obviate this I simply place a "relief" over the entire hard surface, using the usual base plate wax, extending over the surface not onto the soft sides and thinning the margins flush with the model. This, of course, applies only in case of metal plates, and I would say I find better success with the swaged metal plate than with vulcanite. In the latter I obtain the relief by scraping the impression or the plate when finishing.

I have in my collection of models which will be on exhibition in the clinic room every day, some remarkable specimens of this class of cases, even in heavy continuous gum dentures, in these cases showing that weight does not count in the upper denture as well as showing the non use of air chambers.

The problem of the flat lower jaw is greater than that of the upper jaw, largely from the fact that absorption has taken place to such an extent that the lingual muscles are attached to the margin of the jaw so that the plate cannot extend over this margin as will be seen when I place the end of my finger just over the margin, holding it tight and upon lifting the tongue, the finger is thrown out of place. The wearing of a plate under such conditions is difficult enough without the annoyance of having the plate bobbing up constantly in talking.

Any dentist who has not had this experience in his own mouth, has no conception of what patients often have to endure with such jaws. I

have found a very desirable remedy of the difficulty by placing along side the posterior teeth, flanges about three-sixteenths of an inch wide extending from second bicuspid back to end of plate and between margin of plate and necks of the teeth. The cheeks press upon them holding the plate.

To illustrate how these work, while in attendance at a meeting of a dental society, at breakfast one morning, I ate a dish of blackberries. A dentist sat beside me who had seen my jaw and plate. I said, "You have seen me eat these blackberries and would you have supposed it possible to avoid getting seeds under the plate?" He replied "Impossible." I told him there was not a seed under it.

A patient who for a year was wearing such a denture, often came to me for relief. She finally disappeared, was absent from the city for a year, but again appeared saying, "If I had to repeat this experience, I would jump into the lake." I took the plate and put some wax flanges on it, telling her to report next day. She did so, saying it was better. I replaced the wax with vulcanite, telling her to report in a week. She came in smiling and said, "'I am not going to jump into the lake now."

In adjusting a lower denture, I always say, the lower is much more liable to irritate the membrane than an upper set. If it does irritate, you cannot eat. Come back after having the teeth in place for a half day so I can see the irritated spot and I will relieve it. Weight is inadmissable on the flat jaw as there is nothing to keep it from sliding with the head in certain positions owing to weight and lack of lingual margins.

To the dentist, I will suggest, that while he can see the point of irritation, it is not always easy to locate it on the plate. To do this moisten a little whiting and with a spatula, place just a bit on the irritated spot; put the plate back in the mouth, and upon removing it the whiting tells the story. Relieve it with a small carborundum.

In some jaws the opening of the mental foramen is near the surface of the jaw owing to excessive absorption of process. Few dentists are aware of this and cannot account for an irritation at this spot. By pulling away the membrane, the white nerve can be seen.

I will add, although not pertaining to the subject treated, a few things not generally recognized by the profession but still of importance.

Peculiarities Commonly Found

For many years I have called attention to peculiarities pertaining to the left side of the mouth, seldom seen on the right side and yet having to do with the arrangement of teeth and gums.

The first is the recession of the process over the left cuspid eminence occurring in seventy-five per cent. of cases and requiring more artificial gum on the left side for symmetry.

Second, process shorter on left side from median line to the cuspid eminence; teeth to be set not so high as on the right side.

Third, the tuberosity lower on the left side than on the right occurring in ninety-five per cent. of mouths.

Fourth, the lip rises higher on the left than on the right in a majority of mouths; so the teeth show more on the left side when talking.

Fifth, the lower teeth are higher in region of the left cuspid than on the right, and also more prominent in many cases, so it is difficult to arrange the upper teeth.

Sixth, the lower jaw diverges farther from the median than on the right so the teeth need to be set farther over the ridge for symmetry.

Seventh, more absorption on the left side than on the right in many mouths.

Eighth, a peculiar flexible growth alongside the left ridge.

There are some remarkable conditions in regard to the human teeth.

Dr. Bonwill, many years ago, after an examination of more than a thousand skulls, modern, ancient, prehistoric, of all races, discovered that human teeth are shaped and arranged along geometrical lines. That there is a relative proportion in width of the various classes of teeth—centrals, laterals, cuspids, bicuspids and molars. He could tell according to certain rules, upon looking at a tooth, what were the sizes of the other teeth.

Then he discovered that the six anterior teeth form the arc of a circle, the radius of which are central, lateral and cuspid teeth. Upon forming a circle of which these are the radius and placing it upon the incisal edges of the incisors, it will be found that a line drawn through the center will always pass through the center of the second bicuspids and across the posterior margin of the circle will pass across the posterior of second molars.

It also may be seen in a perfect set of teeth that the uppers form an equilateral triangle, the same distance from the median line to rear of second molars as from molar to molar centers.

The width of bicuspids and first molars is same as central lateral and bicuspid.

Principles of Kitami's Rubber Plate Work.

By Dr. Yukimasa Kitami, Tokyo, Japan.

In the making of an artificial denture especially of the upper jaw, it is too frequently observed that if the rugæ and other irregularities of the palatal surface are not perfectly imitated, the denture will be obstructive to the activity of the tongue in preparing the bolus of food for deglution and also to the clearness of enunciation.

In order to be free from these common failures, I undertook to produce an ideal rubber plate which would be satisfactory in this respect, and at last I have attained the successful result of bringing out two special dental materials for this purpose, namely (1) a base plate material; (2) a separating fluid for the plaster.

With the detailed description of the new materials, I intend also to introduce in the following pages very simple principles of making good dentures, which would save a great deal of time and labor for the practitioner.

I will not be considered as merely boasting, when I claim that the dentures brought out by means of the two materials and the principles I advocate, are excellent products, never equalled by any others, when you come to appreciate the high quality of my work. These materials and the principle of making dentures are called Kitami's Artificial Rubber, Kitami's Separating Medium, Kitami's Method of Making Rubber Dentures, respectively.

Characteristics and Uses of Materials.

A. The artificial rubber as a base plate material.

This material is composed of resin, celluloid, silicate, etc., is quite like rubber in several characteristics, and presents a gray or brownish gray tint. It is dissolved by chloroform or xylol, but by neither water nor spirits. It softens in the flame and burns in fire, raising a black smoke, and leaves black ashes behind. It is oxidized and becomes brittle on long exposure to the air. These characteristics show that the material resembles rubber very closely, which is why I call it an artificial rubber. One difference between the two, which we should notice, lies in the ad-

vantage that this material is easily moulded. The characteristics of this material may be summed up as follows:

1. By swaging in a counter-die of modelling composition, it makes a perfect adaptation to the palatial configuration.

2. The thickness of the base plate is uniform in every part.

3. The thickness of the base plate is under the control of the operator, so that we can determine the thickness beforehand accurately.

B. The separating fluid for the plate.

This material is a paste of a pink tint; possesses a peculiar irritating smell and sour taste, and is more or less volatile. It is not dissolved by water, spirits, ether or chloroform, but contracts and precipitates in ether or chloroform. It disappears in an acid fluid and changes the tint to a fine red color; it is solidified a little in alkaline fluids. It forms a thin membrane when applied on the plaster cast, which renders the separating easy and safe. The membrane measures 1/1000—1/13000 inch in thickness, or 1/2000—1/2600 inch after vulcanization. Consequently there may be no need of apprehending alteration of adaptation to the mouth on the completion of the denture. Now I shall describe a few advantages of this fluid.

1. The plate can be withdrawn out of the flask after the vulcanization.

2. The washing of the denture is simple.

3. The surface of the denture is glossy and smooth.

4. The surface of the denture presents the characteristic glossiness of vulcanized rubber.

5. The denture needs no elaborate polishing by file or scraper on the surface.

6. Because of advantage No. 5, the cost of the rubber will be reduced to almost two-thirds, though it is ordinarily high in price.

The Principles of Making a Denture.

1. Preparation.

The construction of a denture is begun by making up a counter-die with modelling composition using the plaster cast as a die.

2. Construction of the base plate.

The process is carried on as follows: first soften the base plate material (the artificial rubber) of the required size over a flame of fire; press it on the plaster cast with fingers, and adapt it into a counter-die of modelling composition, and then withdraw the counter-die by cutting off the superfluous rubber from the margin of the counter-die. After this process, the required teeth are to be set up. The arrangement and the formation of gum are done with paraffin wax as commonly carried on.

During such work, we use a spatula for the most part, and the finish is done with xylol, the result being a base plate of glossy and smoothy surface. In the case of trial adaptation, if needed, the finish will be made after this process as ordinarily done. The flasking is also carried out afterward as in the ordinary way.

3. Withdrawal of base plate material.

Separation is made as in the usual way; the paraffin wax will be dissolved in the hot water. By the pouring of cold water later on, the artificial rubber can be readily separated from the plaster cast.

4. The application of the separating fluid to the bottom piece of the flask.

After the withdrawal of the base plate, the bottom piece of the flask is dried; a small amount of the separating fluid is applied uniformly with a brush, with the exception of teeth and margins of clasps. The fluid dries immediately after it is applied, so that the application can be continuously carried on. With this, the white surface of the plaster cast is tinged pink and becomes glossy. The pink tint changes to crimson as it dries. The packing should be done after the color presents crimson.

5. The application of the separating fluid to the upper piece of the flask.

After the packing of the rubber is carried out in the bottom piece, a trial adaptation is made to the upper one. On obtaining a required amount of rubber satisfactory for the purpose, we use the same process of application of the fluid to the upper piece as described in the case of the bottom one. The fitting to the bottom piece is completed after the fluid is dried up.

After the process above alluded to, the vulcanization is carried out and we separate the flasks, to find the denture lying in the bottom piece, the upper surface of the denture being separated nicely from the upper without the plaster adhering, and with a vivid presentation of the configuration of the mucous surface. Furthermore, the surface is glossy and smooth; it presents the characteristic color of vulcanized rubber. The withdrawal of the denture from the bottom piece is done by a bar between the plaster and the denture. In the denture withdrawn by this method, the palatine surface also comes out without the adhesion of the plaster and is then washed thoroughly by ordinary means. The superfluous rubber at the margin is cut off and polishing is carried out for the completion of the finish.

Here permit me to recapitulate the characteristic advantages of Kitami's methods.

A. The work of making of the denture is simple: the configuration of the mucous membrane, especially the rugæ and irregularities of the palatal surface is clearly presented on the surface of the artificial denture.

B. Polishing is not needed.

C. We can economize in the use of the rubber, which is considerably high in price.

Anatomical Dentures.

By Seimaro Shimura, D.D.S., Tokyo, Japan.

Anatomically the human teeth are planted in the alveolar socket by means of the elastic peridental membrane, each tooth having its freedom of movement. The characteristic elasticity of this pericementum makes mastication easy and comfortable. The student of prosthetic dentistry must constantly bear in mind the importance of making the restoration of lost dental organs as nearly anatomical as is possible with the means at our command.

The artificial dentures that are made in the usual manner have two serious disadvantages.

First, they are attached to large plates which cause great annoyance and discomfort to the patient, in some cases resulting in the abandonment of the plate, owing to the patient not being able to overcome the unnatural feeling of the mouth. This is especially so in the case of upper full dentures.

Secondly, the artificial dentures have their teeth so attached that they become an integral part of the plate; hence each tooth has not the necessary movement and lacks the elasticity of the pericementum as in the natural teeth.

In order to overcome these defects I have tried a process by which the plates are made much smaller and by which mastication is made considerably more comfortable. To carry out my idea I made a great many vacuum spaces along the ridge of the jaw by making small depressions in the negative impressions of the jaws at regular intervals of about one-third of an inch and about one-fifteenth of an inch in depth, right along the line of the ridges of the jaws, as shown in Fig. 1. In order to obtain the maximum amount of suction I have patterned these suckers after those found at the end of the feelers of the octopus. They are round, cup-shaped, slightly protruding at the periphery and gradually countersunk to a hole in the center. This, I find, gives the necessary suction required.

To illustrate, I take a wax bite, set the teeth and invest them in the

usual manner. I use both hard and flexible rubber. The latter is used right round the necks of the teeth and also full under the surface of the plate. I start in packing the case with a small piece of hard rubber right on the pins of the teeth, then pack a little flexible rubber around the teeth. This flexible rubber acts like the pericementum. After

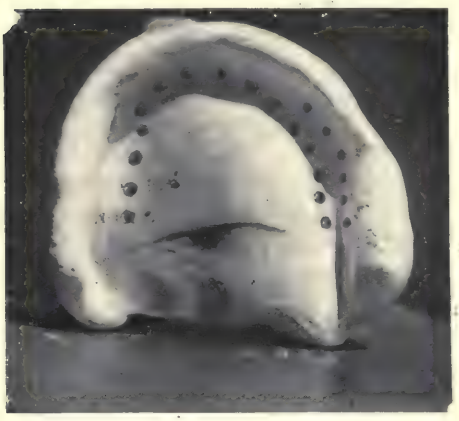


Fig. 1 (negative).

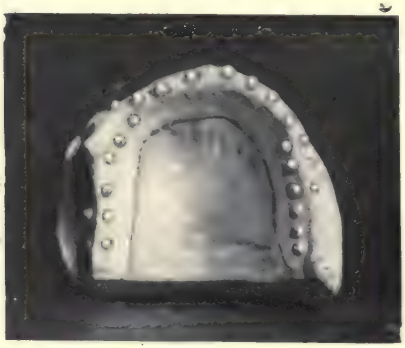


Fig. 2 (positive).

Fig. 3.

this is done, I pack the rest of the space with hard rubber, and lastly I put a sheet of flexible rubber right into the cavity of the other half of the flask and finish the packing. I then vulcanize for two hours at a temperature of 300° F.

The flexible rubber lining used makes the plate, to a great extent,

adapt itself to the surface of the membrane of the jaws, and at the same time gives the vacuum spaces greater efficiency in their action. The flexible rubber used at the necks of the teeth gives them the elasticity which they have in their natural state.

By this process I have succeeded in making plates, which will stay in place, with a great deal less palatine area than has hitherto been possible.

In conclusion I venture to express the hope that through the efforts of my colleagues, the time is not far distant when even partial dentures will be made without any plate at all.

Fig. 1. Negative.

Fig. 2. Positive.

Fig. 3. Showing full set denture.

Papers Read in Section X.

Education, Nomenclature, Literature, History, Legislation.

Chairman's Address.

By C. N. Johnson, M.A., L.D.S., D.D.S., Chicago, Ill.

The subjects assigned to this section are education, nomenclature, literature, history and legislation. Your chairman feels that the officers of the section have been particularly fortunate in the personnel of the men who are to take part in the program, and he hereby wishes to express his keen appreciation of their hearty co-operation.

The subject of education is one which looms higher and higher in importance on the dental horizon. It would seem to be well within the limits of conservative statement to say that in no department of our professional endeavors has there been so rapid a development as there has been in dental education. That this development is symmetrical in every respect no one will claim. There is still much to be done in the way of perfecting certain of our teaching methods even in the best colleges, and there surely is need for improvement in nearly all the methods in vogue in some of our colleges. In fact a very insistent consideration is the one connected with the status of certain schools which, despite the great general improvement in teaching methods and in requirements, have not kept pace with the procession. It is hardly fair that the reputation of those schools which are earnestly aiming to develop the highest order of efficiency in their work should be placed on a par with those whose greatest claim to recognition lies in the statements and promises made in their annual announcements. It is hoped that the approaching four-year course will give the better schools the opportunity they have long wanted to put certain teaching improvements into operation, as it will also compel the weaker institutions at least to do better work than they have done in the past.

It is a regret of your chairman that the section is deprived of a promised paper on the subject of dental education by no less a man than Dr. Edward C. Kirk, who had fully intended to be with us, but who was prevented by the necessity of seeking recuperation and rest.

Nomenclature.

Neither are we to be favored with a paper on the subject of nomenclature. The Chairman tried very hard to secure a paper on this subject, but un-

fortunately those who are in active service on the Committee on Nomenclature in the Institute of Dental Teachers were too engrossed with other duties to enable them to prepare a paper for this meeting. Then again the committee feels that much work must be done on the subject before an authoritative report can be made, and that it will take a year or two to complete the work. This is a matter calling for the most careful consideration. Up to the time of the World's Columbian Dental Congress in 1893, our nomenclature was sadly in need of systematization. At that meeting Dr. G. V. Black made a report which placed the matter on a more scientific basis, and yet from time to time our nomenclature requires a careful revision to bring it into line with modern methods of thought. We bespeak for the committee which has this matter in charge the support and suggestion of the thoughtful members of the profession, to the end that we shall eventually evolve a nomenclature which shall represent the best thought in the profession and be worthy of a scientific body of men. Too long have we been content with a haphazard method of expressing ourselves and an altogether too provincial point of view. Nomenclature has to do with international as well as with national modes of thoughts, and the time has come in the evolution of dentistry the world over when recognition must be made of this fact.

Literature.

The subject of literature is to be well cared for at this meeting. The distinguished gentlemen who are to read papers on this topic need no introduction to this or any dental audience. To the Chairman this is a matter of great satisfaction, because literature is above all things in his mind a matter of prime importance. In fact it is not saying too much to assert that in a large sense a profession is judged by the literature which it produces. To be able to do a thing well is a splendid achievement, but to be able to so record the procedure that it can be grasped and utilized by thousands of others is to multiply the benefits many fold. And this is what literature is intended to do.

It would seem as though our literature might be greatly improved in character, particularly our periodical literature. This is not intended as a reflection on the splendid work that is being done by some of our writers for the dental periodicals of the day. Papers are appearing from time to time in our dental magazines that are a credit to any profession, and yet there is so much of a mediocre character that it brings the level to a rather discouraging plane. Why will not members of the profession dedicate themselves to the cultivation of a higher literary talent, and thus elevate dentistry in the eyes of the world? This question cannot in whole be answered by the sweeping statement so frequently

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made that the preliminary requirements for entrance to our colleges are not sufficiently high to attract men of the mental caliber to produce good literature. The production of good literature demands of a man some thing aside from early educational advantages, and while this is a very important basis on which to build, yet of far greater moment is the spirit of application which impels a man to extend his usefulness in the world by recording his thoughts in such a way that his fellowman may benefit the most by them.

That this can be done by dentists is perfectly evident in our dental text books, which, though not lacking in faults, are very much more creditable in the way of literature than the matter appearing monthly in our magazines. In fact when we consider the volume and character of our book literature in recent years we have much for which to be thankful. That dentists are becoming more extensive readers must be clearly evident from the increasing numbers of our books and the fact that new editions are so frequently called for.

Dental History.

In dental history the situation is encouraging. Thanks to the indefatigable labors of a few men in the profession the records of dental progress are being preserved for future generations. From the classical work of Guerini to the interesting biographical data of some of our American writers there has been evolved through the records of the past a very creditable story of the development of our profession. We are under lasting obligation to the men who have rescued this story from the oblivion into which it soon would have passed.

Dental Legislation.

In the field of dental legislation we have a fruitful topic for discussion. In this country the complications involved in the recognition of State rights introduces inevitably the possibility of much confusion in the legislative restrictions of the various States. We are fortunate at this time in having a paper for Section X by the Chairman of the Legislative Committee of the National Dental Association, and your Chairman feels that he can safely leave the question in his keeping. But there is just one point to which the present writer, in closing, would like to call attention. Recent developments among some of our State Boards would seem to demand a recognition of the evils that may arise from the appointment of a purely political board. It is not within human possibility that a Governor should be able to judge of the fitness of men for positions on State Boards of Dental Examiners so well as can the members of the profession in the given State. When a Governor takes the appointment into his own hands without consultation with the leading men

in the profession, as he has a perfect right to do under the existing laws of many of the States, the possibilities of sacrificing professional merit and fitness for political preferment are too great to be ignored—as is only too apparent by occurrences in the State of Illinois in the past few months.

Not until there is a clause in the law of each State compelling the Governor to make his appointments from a list recommended by the leading dental organization of the State shall we be free from the danger of having discredit thrown upon the profession by the appointment of unworthy men. Some States have such a clause, and the profession should not cease in its efforts till all States are included in this list.

In closing this report, your Chairman begs the personal privilege of expressing his keen regret at his inability to be present and participate in the deliberations of the section. He takes this opportunity of offering in writing what he had hoped to present in person, viz: his compliments to the essayists and discussors who have so generously contributed to the success of the Congress, and particularly to the other officers of the section who have loyally relieved him of much of the burden of preparation. To one and all he sends his fraternal greetings and his cordial good wishes for a profitable and pleasant meeting.

Dental Literature, Past and Present.

By Herbert L. Wheeler, D.D.S., New York.

The literature of a profession may be said to be a picture of the thoughts, aspirations and acts of that profession, at the time in which it is produced. It may almost be said to be an indestructible moving picture of the activities of a profession.

As Omar says:

"The moving finger writes; and, having writ,
Moves on: nor all your piety nor wit
Shall lure it back to cancel half a line,
Nor all your tears wash out a word of it."

In looking over the older literature of the profession, as it appears in books and journals, one is impressed, that whatever else the literature of dentistry may be, it is a picture of a process of evolution; that much that is a subject for essays and discussions to-day, could have been added to the past with great advantage to the efforts of our predecessors. One is also impressed with the fact that much that has been produced in the past, and now lies buried in the stain and dust covered pages of our early literature could be resurrected and reprinted with great advantage to the present.

A general survey of dental literature leads one to believe that however lacking, however stupid, however puerile, much that has appeared in print may be, taken as a whole, the thoughts that have been produced in print, have kept well ahead of the ability of the mass of the profession to understand or utilize them.

A general reading of the journals of thirty-five to fifty years ago and more, such as the *Dental News Letter,* the *American Journal of Dental Science,* the *Dental Cosmos,* the *Independent Practitioner* and *International Dental Journal,* the *Dental Register* and the *Dental Review* would convince most people that the editors and writers of the earlier times were quite as sincere and desirous of improving the quality of their service as the profession is to-day, and from the simple and direct

language used in most cases, one is forced to conclusion that they were quite as sincere in their motives.

Early Journal Literature.

The subjects that were considered worthy to be published in many of those early journals published from 1847 on, were much more varied and covered a wider field of interest than the articles treated in the modern dental journal. Corollated science and science in general, were more often represented in the reading pages of those journals than it is at the present time, though it may be said that the rapid strides which dentistry has made and its close relation to the physical welfare of the people have largely broadened the field of dental research so that there is scarcely time at present for the profession to read such articles; hence the journals of to-day do not publish them. On the reverse side however, it may be said that the increased demands made of men before they may enter a dental school and the steady rise in standards of preliminary education, have not after all succeeded in producing such a superior type of brains in the dental profession as many had hoped for, so that a discussion of allied sciences and other matters of interest in the dental journals of to-day, might be of considerable interest and value to a profession whose members at least are not over-educated.

The early writings of our literature seems to have been predominated by articles and essays intended to tell how to do practical and technical work, and the thought uppermost, to judge by the greater proportion of articles of this type was that dentistry was largely a mechanical art. The thought that the mouth and teeth might have some relation to the general health and that their structure and welfare was a thing to be studied, and a knowledge of their embryology and histology acquired, does not appear to have been considered seriously much before 1880.

We find in the *Dental Cosmos* scientific articles from the pen of the late Dr. C. W. F. Bodecker, in 1879, and by J. L. Williams on *"Dental Embryology,"* in 1884. The *Dental Review* started off in 1886, with articles on *"Dental Pericementum,"* by Dr. G. V. Black and the first papers from Miller on *"Micro-organisms,"* appear in the *International Dental Journal* in 1888. This may be said to be the time at which some members of the profession began to awaken to the fact that proper care of the mouth and teeth was quite as much one depending upon a thorough knowledge of hygiene and pathology as upon mechanical ability.

From this time on there seems to have been a general tendency of the profession to generally become more and more interested in the scientific facts and alleged scientific theories than in the technical and mechanical requirements, until at the present day it is rare to find a

genuinely practical treatise on the technical and mechanical construction of dental reproductions, without its being so shrouded in untested theories, that little dependence can be placed upon them as statements of facts; that is the general training of the profession seems to be so lacking in some things that a great many suggestions and possibilities seems to be, by many, taken up as proven and not to be questioned.

The tendency of the earlier literature of the profession to abound in frank and sane discussions which sometimes were a little harsh, seems to be going out of vogue. This is unfortunate and a detriment to the proving of facts. That which is desirable in any profession, is the separating of theories no matter how plausable, from proven and tested facts. The only possibilities of advancement along lines of usefulness to the public is for the profession to acquire an accumulation of facts which will stand the test of time and so little of our modern literature is devoted to this task that there is much danger of the valuable and useful being smothered by the modern avalanche of alleged scientific treatises and articles.

Journal Literature of Today.

The resurrection of a very old hope in the efficiency of hygienic care, through prophylactic treatment, has let loose in the dental journals of to-day, a horde of writers whose chief aim is to get proprietary remedies before the public through the kind assistance of the dentist. So adroitly has this been managed that many of us are constantly used as salesmen for proprietary articles or substances that are useless or worse than useless. With these vampires of the profession has appeared a tendency to laxity of statement that to say the least, is disturbing to those who have the welfare of the profession at heart.

I mention these, to make a point which coincides with statements which I made in a paper read before the National Dental Association last year. My statements were to this effect: "That solid, reliable, and responsible scientific matter of great dependability was more likely to appear in books which were written in their entirety, by one author, than in dental journals, or in books in which the various subjects were treated by different individuals."

Many of the writings of Sir John Tomes, W. D. Miller and G. V. Black appeared in dental journals; their masterpieces, however, have appeared in book form and as such will be retained and referred to when the matter in the journals has long since disappeared through the channel of the waste paper basket. This is not meant as a reflection upon the dental journals, for I realize that journals, not unlike daily papers, in

order to exist, have to give considerable space to the fad of the hour. Many worthy editors of whom we have not a few, realize and deplore this situation, but it is one of those things that is demanded by environment and the state of culture or lack of it, in the profession.

There are several things that have tended to increase the difficulty of maintaining high class literature in the dental journals uniform in recent years. With the increase in population and what is more important, the increased interest of the public in their physical welfare, there has come into the field a vastly greater number of dentists. The influence of this vast army of dentists upon the masses who are beginning to awaken to the value of good teeth and clean mouths, if they desire good health, is a valuable asset for the purveyors and producers of dental nostrums of all kinds. Unfortunately some of the worst cases of fraudulent tactics and improper and untrustworthy statements concerning the value of these nostrums, to the public, emanate from members of the dental profession who are either the proprietors or are financially interested in the sale of these goods because of their having been at one time recognized by the profession and the dictates of courtesy allow them privileges that the ordinary layman may not obtain. Taking advantage of these privileges, all sorts of fraudulent and questionable literature is appearing at the present day, claiming to be scientific and many of the perfectly well meaning members of our profession are lead astray by these bunco steerers. This probably is the most demoralizing influence that the dental literature of to-day has to contend with.

I am glad to say that signs are not wanting, that the profession is becoming alive to this and that it will eventually be eliminated from dental literature because it will become unprofitable.

Supply House Journals.

Another cause for a tendency to degeneracy in dental literature may be found in the action of many of the more modern supply houses, who, finding that they could publish a dental journal and hire an editor, for what the cost of advertising would be, or less, have established journals, hired editors and proceeded to pose as bona-fide mouth-pieces of the dental profession. Being published as an advertising proposition the cost of publication has not necessarily been one of the considerations.

The host of journals of this type, that have appeared in recent years, has not only cheapened all dental literature appearing in dental journals, it has reduced some journals of old and reputable standing, to a standard much below that which they had upheld in the past. Thus has the demoralizing influence gone on through commercial lines, so that at the present time, the probabilities are that a large majority of the only valuable literature appearing in dentistry occurs in books, and in most cases in

books which are the products of a single author. A careful perusal of a book on *"Dental Pathology,"* by Dr. G. V. Black, which has recently been published, has strongly convinced me that my belief in this matter is a correct one. The detail in which the subject treated therein is taken up and discussed, the accuracy of terms used and the sanity of the statements there affirmed, put in contrast with much that is appearing in the dental journals to-day upon the same subject, makes one gasp at the hardihood of some of the would be essayists in the world of dental literature.

Much that I have said appears to be pessimistic, but I am not as pessimistic as would seem, for there is a great influence at work which will remedy the literary difficulties which I have spoken of and eventually bring the standards in our profession out of the slough of empiricism and place them upon a foundation of proven facts. This influence is the increased ability of the profession to discriminate between the real and the artificial. Like evolution, this ability on the part of the dental profession to choose the good and avoid the bad, is of slow growth, but it is a growth, and a growth that will come eventually in spite of the chaos, the haphazard methods and the hardihood of the insincere and commercially inclined members of the profession.

Some Suggestions in Securing Adequate and Uniform Dental Legislation.

By Homer C. Brown, D.D.S., Columbus, Ohio.

If the Golden Rule was generally observed there would be little occasion for so much local, State or Federal legislation. If those representing our diversified interests were more considerate of the rights of each other there would be less discord and more general progress. When these various interests, either individually or collectively, think less of self and personal gain and more of their fellowman and what will benefit the greatest number, then, and not until then, can satisfactory results be accomplished without strict and specific laws being enacted in order to regulate and harmonize co-relating activities.

However, we appreciate that there is too much of the ideal and not enough of the practical in this opening statement, and that the exigencies of the present call for a safeguarding of our interests as they relate to questions of an individual and of a general nature. This is especially true at this particular time when the eyes of the allied profession, and the laity are focused upon us more hopefully than ever before. The recent investigations, which have quite closely and positively associated pathological oral conditions with general systemic disturbances, and the effecting of our present strong and representative national organization, with its various activities and unlimited opportunities, are largely responsible for this favorable situation.

Further, for some years there has been general and positive tendency toward increasing all professional standards, the need of which, as applied to dentistry, is increasingly being recognized by all who are in a position to be familiar with the situation, except, possibly, a limited number who may be influenced by personal interests. All of this emphasizes the need for legislation which will conserve our inherent rights and at the same time develop a better equipped dentist, in order to creditably discharge our responsibilities, thus wielding an influence which will tend to place our profession upon a higher basis. It is very important that this question be met and solved in a frank and intelligent manner, to the

end that the dental graduate of the future may be better prepared to make a more liberal contribution to the net results of scientific investigations. Most of our members have an intensified practical development, which is particularly advantageous in restorative and constructive dentistry, but only a limited number have received the education or training necessary to qualify them for any scientific investigation, and this proportionately restricts our usefulness and influence.

By adequate and uniform legislation, we refer to the enactment of such laws as will uniformly give our members all the rights and privileges to which they are entitled, using as a standard the rights and privileges enjoyed by other professions in relative proportion to the importance of the service rendered and the general benefits made possible through such service and legislation. More than this is not due us and should not be expected, but it should be borne in mind that nearly all meritorious legislation is the result of some intensified educational campaign which has aroused a lethargic public and stimulated an interest in the benefits to be derived through the adoption of the advocated proposition. Also, it must be admitted that much of such legislation is the result of compromises, and for this reason some think it advisable to make provision in advance for points of compromise, when it is clearly evident that strong opposition may develop.

All special legislation, such as dental legislation might properly be termed, usually requires considerable effort and worry upon the part of those directly interested, especially those having this work in charge. The fact that our profession seldom has representation in legislative bodies greatly adds to the difficulties confronting a legislative committee. This is quite unfortunate and is more or less responsible for the fact that adequate recognition has not been given to our interests in the past. It is no consolation to be told. "We did not think of you dentists when this matter was under consideration," as the writer has been told on past occasions, but in Ohio a marked change in this respect has taken place.

Usually the highest type of our members enjoy the most remunerative practices, and they have a hesitancy in sacrificing the time and energy necessary to serve in capacities where they would be of service in our legislative efforts. This is largely responsible for the lack of favorable representation in the legislative halls and other public offices. Further, legislators and other public officials are usually desirous of rendering such service as their constituents desire, provided it has merit, but from experience in this work it has not been unusual to be told by these officials that they have never been advised as to the attitude of any of their home dentists regarding the questions under discussion. Such general indiffer-

ence has been a decided handicap in the past, but it is hoped that a more general co-operative policy, in this and other matters, will result from our present plan of organization.

Uniform State Laws Desirable.

The necessity for uniform legislation in the various States is recognized by all, especially when we consider the wide range of our present State dental laws and that each State is a power unto itself, which will naturally have to remain so. However, if these State laws were practically uniform, which is not unreasonable or impractical, it would not be so embarrassing to some of our prominent members when they desire to change locations, as conditions may develop at any time with any one making this necessary. There is no reason why a reputable and competent practitioner of one State, who has been in practice for some years, should be required to undergo a positive hardship in order to practice in another State. In making this statement, it is not intended to convey the impression of advocating the removal of every restriction, such as requiring credentials of reputability and character and the paying of the regular fee.

This applies with equal force to the various State laws regulating, or rather not regulating, the entrance requirements to the dental colleges. In order to correct this, there should be a general and concerted effort to harmonize these laws on the highest possible basis, although it is appreciated that the task will be an extremely difficult one and will probably require considerable effort, time and expense, but "nothing risked is nothing gained." In our efforts to secure uniform State dental laws it will be advisable to endeavor to make provision which will *remove the appointment of members on State dental boards as far as is possible from politics.*

The question of determining and securing adequate and uniform State dental laws should be very carefully studied from all angles, and it is suggested that if the National Dental Association's Committees on Dental Education and Dental Legislation; the Dental Educational Council of America; committees from the National Association of Dental Faculties, and the Dental Faculties Association of American Universities and the National Association of Dental Examiners were to make a determined effort to work out a satisfactory solution of this question, they would be successful. If successful, then every organization mentioned should approve of the findings and through such co-operation it would not be long before a decided change would take place in State dental laws.

The Ohio Plan.

There is another plan of practical co-operation, which proved very successful in Ohio during the past year, and it is recommended to other States as worthy of careful consideration. Last September representatives of voluntary organizations and State Boards interested in general health questions met in Columbus to discuss legislative matters preliminary to the convening of the General Assembly, January 4, 1915.

A prevailing sentiment for some plan of co-operation was manifest and this resulted in a subsequent meeting being arranged at which time officials and representatives from a larger number of organizations and boards were present, and at this meeting the Ohio Public Health Federation was organized. In this organization the following voluntary associations and societies are represented:

The Ohio State Medical Association.
The Ohio Society for the Prevention of Tuberculosis.
The Ohio State Pharmaceutical Association.
The Ohio State Dental Society.
The Homeopathic Medical Society of Ohio.
The Ohio Medical Veterinary Association.
The Ohio Eclectic Medical Association.

These societies have been listed in the order of numerical strength, and, when combined, represent a total membership of nearly 10,000. Each organization selected a Columbus member as its representative on the Executive Council, with authority to take final action in all matters wherein its interests were involved. In addition to these, several State Boards interested in such legislation were represented, which gave the council a membership of twelve. Frequent meetings were held to consider bills emanating from affiliated organizations and boards, as well as such other bills as were introduced in the Legislature that had any relation to the interests represented.

After a very careful consideration of a bill in question, it was approved or disapproved by the council. However, in some instances, important changes were made prior to approval. Each organization and board represented furnished the Executive Council with a list, giving the name of a member in each of the eighty-eight counties in the State. These persons were to be the county committeemen, and the success of our campaign very largely depends upon their co-operation. Some of the smaller organizations did not have a committeeman in each county, but the Federation mailing list included 890 names. The Executive Council established an office and took up the work one month in advance of the meeting of the Legislature, arranging the details for the campaign.

A general letter outlining the plan was mailed to each member of the Legislature before the session opened, and a detailed outline of the plan was mailed to each committeeman. Circular letters were sent to these committeemen from time to time, informing them of the action of the Council with reference to certain bills giving a synopsis of these as well as giving the Council's arguments for or against a measure and keeping them advised with reference to the progress of the legislation in which all were interested. A large amount of effective work was naturally expected of and done by these county committeemen, who were to get in touch with their Representative and Senator and in this way the legislators received the information which usually influences them, that is, it represented the wishes of their constituents. In some instances, the committeemen of various organizations in a county would arrange to take these matters up together and present their claims to their Representatives in the General Assembly.

A total of 1,045 bills were introduced, and many of these had a direct or indirect bearing on public health questions. Some very important and advanced legislation in this connection was passed and some other very drastic measures were defeated. Fourteen important bills were approved by the Federation, nine of which were enacted into law. Four of the five which were defeated were lost by a close vote, but they will serve a temporary educational purpose at least. Eight bills were disapproved and all were defeated.

Financial Scheme.

In order to meet the expense incident to this co-operation, a maximum assessment of fifteen cents per capita, payable in three installments, was made and collected, but a considerable balance of the last assessment remains in the treasurer's hands. In other years some of these organizations spent more than the combined amount and failed to secure any legislation. It is not the amount of money expended in such work that counts, as usually the co-operation which is not purchasable is the kind worth while.

It is the intention to keep this Federation intact, even though the Legislature meets only bi-annually, but occasional meetings are to be held in the interest of the general question.

While this plan is especially applicable for State legislation, yet it would seem there would be no valid reason why it would not be practical in national affairs. In our efforts to secure national legislation it is very important that all phases of any proposed legislation be thoroughly understood and approved, and then our entire organized profession should give

loyal support. Further, it is quite important that all such efforts should be expended under the direction of some responsible head or committee, since individual efforts and working at random frequently cause confusion. Two instances are recalled where best intentions undoubtedly prompted certain activities, which resulted in a considerable handicap in one instance and quite an embarrassing experience in the other.

Therefore, the moral to this is, *"In union there is strength."*

Commercialized Education and the "Itinerant Instructor."

A Study of the Conditions Under Which the Practicing Dental Surgeon Sometimes Receives Post-Graduate Instruction

By Herbert J. Samuels, D.D.S., Oakland, California.

I have selected as a prelude to my paper the following paragraph, quoted from the Midrash on Ecclesiastes I:

"One does not go to the trouble of examining a pig or a camel to see whether it is fit to sacrifice on the altar, but one generally examines a clean animal to see whether it is free from those defects which disqualify it as a sacrifice on God's altar. So one does not criticise the actions or scrutinize the life of the 'man in the street,' but if one possesses piety and learning and poses as a religious teacher he must expect to have his life and actions tested and examined, so that it may be known whether they are in harmony with his professions"—Midrash, Ecclesiastes.

Education.

Education is the acquisition of knowledge. It includes the entire course of training, moral, intellectual and physical, and is wholly the function of the State.

Realizing that intelligence, industry and integrity are the great factors in the betterment of the conditions of life, the State assumes the responsibility for the character of its citizens. It provides, free of all direct cost to the individual, or for a minimum charge without profit, schools and colleges where students of all ages and both sexes may study to attain proficiency in some branch of learning, and graduates those who have passed the regular requirements, certifying to that fact with proper credentials.

Teaching.

Teaching, of itself, does not pay (as compared with other vocations or professions requiring the same amount of time and effort). Educational institutions of high order are not money-makers, and the greater the institution, the more it depends on endowments and State assistance.

Universities.

Education in State universities, from the point of realizing interest in dollars and cents on the investment, is entirely devoid of profit. The total

amount of fees paid by students each year, in most State universities, would hardly carry the current expenses above three or four months. Especially in medical and dental colleges is the cost of instruction far above the receipt of fees for tuition.

Our State colleges tend to develop a graduate student "within a system of academic forces which exert a constant influence upon his ambition, his ideas of a scholar's vocation, his habits of study, his methods of research, and thus set a limit to his possible attainment." [1]

The raw material of the college is not always left to the selection of the management or faculty. The educational institution does not, like an up-to-date factory, throw out its defective product and destroy it. It must give to the world an imperfection-burdened product.

In addition to the character-forming powers of the college, there are other and outside influences, more or less potent, at work—the home, the church, social life and associations, and, perhaps, fraternities.

The Graduate.

The average graduate, fresh from a three or four years' course at college, is not always mentally fitted to grasp the high ideals of professional life and work. We need a higher development of mental attitude on the part of the individual. Still, the presence of a marked individuality may rise above the influence of those forces and enable the student to manifest a superior order of excellence.

Still, again, "true scholarship has power within itself to correct its own defects and transcend its own limitations, if there is only the passion for knowledge and the unwearying zeal to possess it." [1]

Proper early training, therefore, is necessary to develop a character with true professional ideals and attainments.

American Schools.

"The American schools, public, private and endowed, have always tried to give some lessons in behavior, manners, duty and patriotism, but the social and industrial experiences of the past twenty years prove that enlargement of this sort of teaching is imperative." [2]

Would not the present status of post-graduate instruction and education in dental medicine lead one to believe that enlargement and development of teaching and training in this branch of science is also imperative?

The boy is required to plane a board to a true level, or the girl to produce a pudding from an accurate recipe—training him or her to get *moral effects on his or her character,* as well as a material result.

"Certain complex reflexes are known as instincts. These play an important part in education. . . . The instinct of acquisitiveness, construction, possession, self-assertion, anger, self-abasement, rivalry, pugnacity, etc., . . . need to be controlled and directed, and this constitutes

an important part of education. . . . A part of education consists in inhibiting reflexes and suppressing misdirected instincts." [8]

Might I suggest, then that the *methods* and *results of early training* are, in part at least, responsible for the complacent attitude of the dental surgeon who buys instruction from commercial sources?

Commercialism.

Perhaps the worst blemish on American education is the blight of commercialism.

Emerson has written: "I hate this shallow Americanism which hopes to get rich by credit, to get knowledge by raps on midnight tables, to learn economy of the mind by phrenology, or skill without study, or mastery without apprenticeship. . . . We countenance each other in this world of show, puffing advertisement, and in the manufacture of public opinion; and *excellence* is lost sight of in the hunger for *sudden performance* and *praise.*"

There is no short cut to fame, to proficiency, to professional prominence. These are the results of time and experience, built on a foundation of *learning, real* ability and *actual* accomplishment.

Rapid-transit to place, one-night-excursions to riches, and the midnight-express to the specialist's office, are the false lodestones that lead the practitioner to peril.

Where there is speed there is danger.

The talent to deliver a "sales talk," repeated parrot-like, does *not* indicate ability to *serve a suffering patient.* Real power is not the result of a puff of wind. Mushroom growth is only superficial area without foundation or sound support. Cumulative knowledge, the accretions of experience, years of study and months of service produce the sturdy oak of effective power.

As a source of instruction, then, it must be admitted that the college stands for *real culture,* for the development of *character* and for the dissemination of the *highest ideals.*

It is *not* an institution conducted for profit. It has nothing to sell. Its announcements *do not* induce a "mental 'get-rich-quick' attitude, which causes the pupil to be inclined to overlook the *essential* in favor of that which *seems* to promise more practical and speedy results."

The Traveling Teacher.

What is the status of the traveling teacher who organizes classes at so much for the "course"? Is his motive *education* or *exploitation?*

We learn from Deuteronomy that the selling of knowledge for profit is not ideal. "In vain have you acquired knowledge if you do not impart knowledge to others."

Medicine is a profession to which men give themselves from the highest of ideals—that of service and the good they can do humanity.

The true doctor is a teacher in the *broadest* sense and does not sell his learning for profit as a merchant markets his goods.

Alluring announcements of wonderful cures to be accomplished; extravagant expressions extolling the exclusive quality of stated brands and instruments; catch phrases and epigrams to call attention to various methods and systems; rhetorical flashes and scintillating paragraphs of literary effort to attract to magic processes and hidden by-paths to larger fees; these are the things that tempt the dentist to enroll for the commercialized post-graduate course.

Let me repeat: "A mental get-rich-quick attitude is sometimes induced, which causes the pupil to be inclined to overlook the essential in favor of that which seems to promise more practical and speedy results."

It would appear from the announcements of one of the commercialized courses referred to that the course will not benefit one so much for the greater amount of knowledge one will gain, but because "instead of a few dollars one can easily secure a few hundred dollars." And how clever and ethical it must be to collect a large fee when "the patient is kept in an intoxicated condition, where he is easily influenced by outside conditions. . . . By suggesting to the patient that he is all right, that he is a fine patient and that you are getting along splendidly with his case, you keep him interested and make the operation easier for both of you, and he will thank you for all this, . . . and . . . the patient feels you have given him more than he has given you, and that you have done something for him no other dentist could." We read further: "Do not talk fees until you have entirely finished your selling talk."

On another page, in another place the following appears: "Enroll for our summer school. Learn to do painless operating now. Capitalize your spare moments. Get ready for bigger fees in the fall. Send only $3.05. This amount will bring Lessons 1 and 2 of our course, together with this complete (————) outfit."

Another attractive announcement states that "the real problem confronting you now is how to earn more money legitimately without increasing your working hours."

An advertisement of a course of instruction (which includes neither instruments nor apparatus) informs the reader that the "Practitioner's Course ——— is thorough and practical. Dentists equipped with the (————) school instruction are no longer in a position inferior to that of general physicians, but are at the very top of the healing art." Another paragraph still further informs one of wonderful results to be had with the specified instruments, sold only with the course of instruction.

Is this to be our incentive for taking post-graduate instruction? Are we to use the art and suggestion of the quack, charlatan and fakir? Shall we enlarge upon the methods of "itinerant instructors," who, pregnant with promise, glowingly inform us that the path to success is paved with golden reward through *their* systems and with *their* appliances?

Perhaps such as the foregoing inspired Dr. H. A. Frederick, the president of the California State Dental Society, in 1914 to write the following paragraph in his annual address:

"The 'post-graduate' course is offered because there appears to be a demand for it. But it should come from the same authoritative fountain-head that gave the doctor his degree, not from an individual or corporation who makes his teaching a business for material profit, or one who uses it to introduce and aid in the sale of a preparation or instrument or apparatus. The responsibility of source, the authorship of statement should be above reproach. It should be a reflection on professional dignity and offensive to professional pride to accept from an itinerant instructor that information which subsequent events might show to have been offered with whatever prejudice or partiality it had been profitable to suggest."

From the evidence at hand, then, it would appear that the primary object for offering many commercialized post-graduate courses is *exploitation,* not education.

Profuse proclamations of proprietary possessions of skill and knowledge are misleading—to say the least. In the present day no one man, society or institution has a monopoly of learning. The resources and official position of the reputable college make it possible for it to be among the first to obtain new facts and place them properly and conservatively before its students.

The Remedy.

Wherein lies the remedy? Dr. Arthur D. Black says that "The dental profession cannot successfully handle the problems now confronting it with the present type of dentist. We must develop both in our schools and from among ourselves a new type. There must be a new dentistry, just the same as there has been in process of development a new medicine. The new dentist must be essentially and especially a man who *thinks,* whose principal service to his patient is mental, not mechanical. This man must also have a broader basis for his thinking than we have to-day."

To summarize: Education is the acquisition of knowledge. Education is provided by the State without profit, and its educational institutions are not money-makers. No one man, society or institution has a monopoly of learning.

The student is not always mentally fitted to grasp the high ideals of professional life and work. Proper early training is necessary to develop character with true professional ideals.

"'Tis education forms the common mind;
Just as the twig is bent the tree's inclined."

So-called instruction is offered the dental practitioner from what appears to be commercial sources. The reliability of the information imparted (the statements as to its usefulness and value having been questioned), is apparently not above reproach.

The practitioner is to be criticized for what appears to be a mental get-rich-quick attitude.

The traveling teacher is said to be engaged in exploitation, not education.

Wherein lies the remedy?

A new type of dentist must be developed—one of high character and lofty professional ideals—a thinker, a man of learning—intrinsically worthy of his degree and title.

A further extension of the function of the college to enable it to supply the apparent need and demand for post-graduate instruction for the practitioner.

Courses must be arranged so he can obtain new facts and become acquainted with new theories without loss of unnecessary time from practice.

The source of all information should be above reproach.

References.

1. John Grier Hibben (Princeton Univ.). In a paper read at the annual conference of the Association of American Universities at the Univ. of Ill., Nov. 7, 1913.

2. Charles W. Eliot (Cambridge, Mass.). Present Problems of Education—Educational Review, Vol. 47, p. 237.

3. Victor C. Vaughn (University of Michigan). In an address to students at Ann Arbor. Science Magazine, Vol. 40, p. 685, Nov., 1914.

4. F. C. Luck (Whittier, Cal.). Ethics of Education—Educational Magazine, Vol. 29, p. 201.

5. Deuteronomy Rabba, 2.

Organization and Progress of the Dental Corps of the United States Army.

By First Lieutenant G. H. Casaday, Dental Surgeon, U. S. Army.

By an act of Congress approved February 2, 1901, the Surgeon-General of United States Army was authorized to appoint with the approval of the Secretary of War, thirty dentists to serve the officers and enlisted men of the regular and volunteer armies.

Under the authority of this act the Surgeon-General appointed a Board of three gentlemen who were well qualified to conduct examinations and organize the Corps, and convened the Board February 18th, instructing them to formulate plans and be prepared to take the first class for examination on the 25th.

Plan of Examinations

The plan submitted by the Board and approved by the Surgeon-General was: First; that the candidates should be required to pass a written and oral examination in theoretical subjects which form the curricula of the colleges that are members of the National Association of Dental Faculties, namely: anatomy, physiology, histology, physics, metallurgy, chemistry, dental anatomy and physiology, dental materia medica and therapeutics, dental pathology and bacteriology, orthodontia, oral surgery, operative dentistry, and prosthetic dentistry. Second; that they should prove to the satisfaction of the Board their ability to perform the usual dental operations and laboratory work by clinical tests upon patients presented for that purpose. The tests in operative dentistry were as follows: 1. Examination of the oral cavity and recording conditions. 2. Preparation of the cavities. 3. Instrumentation and technique. 4. Preparation and manipulation of filling materials. 5. Insertion of fillings. 6. Treatment and filling of root canals and preparation of root for pivot crown. 7. Manipulation technique in removal of salivary deposits. 8. Application of the rubber dam. 9. Diagnosis, prognosis and treatment of oral diseases. 10. Care and sterilization of hands and instruments. In prosthetic dentistry: 1. Impressions in plaster of Paris and modeling compound; casts, bite and articulation. 2. Contruction of a denture of vulcanite. 3. Construction of a die and counter-die from

a model to completion. 4. Construction of a swaged plate with metal and vulcanite attachments. 5. Construction of shell crowns and Richmond crowns. 6. Construction of inter-dental splints.

An average of seventy-five per cent. was required in the theoretical and an average of eighty-five per cent. in the practical examination. This made it certain that none but good operators would be appointed. The examination covered a period of two weeks—one week for the theoretical topics and one for the clinical work. By this system of examination the Board was confident that it would be able to eliminate the incompetent and undesirable applicants, and to a large extent this was done. Of the eighty-six men invited to take the examination, sixteen failed to appear, eight of the seventy examined were physically disqualified, thirty-three withdrew before completing the theoretical examination, seven failed on the latter, three were fully examined and rejected, and nineteen passed, were recommended by the Board to the Surgeon-General and were appointed. The law provided that those enlisted men of the Hospital Corps who were graduates of a dental college and had been detailed for the previous twelve months to render dental service in the army, might be appointed without examination. Under this provision of the law the Surgeon-General appointed five men then in the Philippine Islands, and with the three men of the Examining and Supervising Board, the Corps had twenty-seven members by the end of July, 1901.

Equipment.

The examination of candidates was only a part of the organizing of the Corps. Before any work could be done it was necessary that instruments and materials with which to operate be furnished the men, and for this purpose the Secretary of War ordered the Board to proceed to Philadelphia to select the necessary supplies. This was no small task as it was imperative that only instruments useful to the average operator be purchased, as all of the men necessarily were required to have identical equipment. Chests were designed in which to pack the instruments and supplies and the whole had to be light and compact; four chests, a field desk and a bundle of folding tables and field chairs weighing in all about four hundred pounds constituted the field outfit. It was estimated that the supplies contained therein were sufficient for about three months. Then a nosological table was prepared in order to secure uniformity in the monthly reports required. This table enables a man to describe the location of a tooth, the location of the cavity in the tooth, and the name of the filling material by the use of three letters and one figure, and the whole is so simple that anyone can make out the report after but a few hours of instruction.

The Board, after being in continuous session for five and a half months, nearly all of the time with a class under examination—sometimes two classes—finally adjourned on July 31, 1901, and proceeded to the stations designated by the Secretary of War, viz: John S. Marshall to the Presidio, San Francisco, California; Robert T. Oliver, Manila, Philippine Islands; Robert W. Morgan, Havana, Cuba.

Assistants.

To facilitate the work of the Corps each dental surgeon was provided with an assistant who was detailed from the privates or acting stewards of the Hospital Corps. These men were required to do the clerical work, sterilize and care for the instruments, and assist the dental surgeon in his operations. The energies and resources of the Dental Corps were taxed to their fullest extent in caring for the officers and enlisted men who sought their services for the relief of suffering and this made it necessary in some instances for the dental surgeon to operate daily from eight in the morning till five or six o'clock in the evening. The great amount of service rendered by the dental surgeon could not have been accomplished but for these long hours and the assistance he received from the member of the Hospital Corps. The number of persons treated during the calendar year of 1901 was over nine thousand. This is a highly creditable showing when the facts are taken into consideration that the Corps was not fully organized at the close of the year, that much delay was experienced in transporting them to their first stations and equipping them for service, and that considerable time was lost traveling from station to station. The character of the service rendered by the dental surgeons during the first year, by reason of the great number of patients who applied for treatment, was largely of an emergency nature and the constant effort was made to so treat the cases as to return the men to duty with the least possible delay.

Services Satisfactory.

The services of the dental surgeons, after only a few months' duty were highly appreciated by the officers and enlisted men of both the regular and volunteer armies and had proven very satisfactory to the Medical Department because the dental surgeon was able to relieve a great amount of acute suffering and to conserve a large number of teeth and to restore them to a healthy condition, thus almost immediately returning to duty many cases that were previously carried for several days on sick report. The Surgeon-General reported that "the cost of maintaining the Dental Corps was small when compared with the relief from suffering obtained and the greater efficiency of the officers and men who have received the services of the dental surgeons. Good teeth are an essential factor in maintaining the general health of our

troops, and consequently their efficiency, and on account of the increasing prevalence of dental caries and the abnormal condition growing out of disease, the dental surgeon has become a necessity to the army. Early provision should therefore be made for the establishment of a permanent corps of dental surgeons attached to the Medical Department."

At the close of the year there were seventeen members of the Corps in the Philippine Islands, two in Cuba, one in Porto Rico, and seven in the United States. Examinations were conducted by the President of the Board at the Presidio, San Francisco and three candidates were appointed by February 3, 1902—just one year after the law became effective. In the meantime, however, one of the men died and one, due to ill health in the tropics, resigned. These vacancies were filled and the men were in the Philippine Islands before the last of May—making a total of twenty men of the Corps serving in the Far East.

Further examinations were given as candidates presented themselves, thus creating a list of eligible men who could be given contracts immediately upon vacancies occurring. In March, 1907, Congress authorized the employment of one additional dental surgeon with the proviso that one be stationed at West Point at all times.

Unsatisfactory Status.

During the first eight years one or two of the older men left the service each year to engage in private practice. In 1909, five of them asked to be sent to their homes. None of the men of the Corps were satisfied with their status. They were neither officers nor enlisted men. They were civilians employed under contract to render certain service, yet they were required to wear a uniform similar to that worn by officers but without the shoulder strap—the distinctive insignia of an officer. The contract provides that dentists should have quarters as allowed an assistant surgeon with the rank of first lieutenant but if there were no vacant quarters the assistant surgeon was permitted to take quarters of any officer of less rank, while the dental surgeon could not take any quarters occupied nor could a house be rented outside of the post for him as is the case with officers. An officer's pay increased every five years up to twenty years and upon promotion; the dental surgeon's was fixed at $150. On foreign duty officers received an additional ten per cent. pay to cover increased expenses; this was not allowed for the dental surgeon yet his expenses increased just as much as did the officers. For certain specified service an officer or enlisted men received a campaign badge and this becomes part of his uniform; the dental surgeon rendered equally hazardous service but no provision was made authorizing him to wear such badge. It was early recognized that the mem-

bers of the Corps would have to be commissioned officers if capable men and satisfactory service were desired. Bills to increase the efficiency of the Dental Corps were introduced in every Congress since 1902. These bills provided for an increase in the number of dentists up to one for each thousand men of the army and that the dental surgeon be commissioned in the grades of first lieutenant, captain and major. This would have allowed an increased pay and official standing as the men advanced in years, and would have been sufficient inducement to attract bright young men from civil life and to retain them in the service. Usually these bills passed the Senate with little or no opposition but did not come to a vote in the House of Representatives and consequently died with the adjournment of the Congress.

Corps too Small.

In his report of 1909, the Surgeon-General recommended that the Dental Corps be increased up to sixty. This number would be sufficient to give every enlisted man in the army one treatment or sitting each year. At that time the proportion or ratio was one dental surgeon to 2,740 enlisted men, and little more than first aid or work of a temporary nature could be rendered. All of the dental surgeons within the continental limits of the United States performed in that year, 25,949 operations, yet this was only 433 operations for each thousand men. In nine months of the same year one dental surgeon in the Hawaiian Islands performed 2,162 operations—the ratio being 2,041 for each thousand men. They averaged less than one operations for each two men in the United States while the average was a little more than two operations for each man on duty in Hawaii. Four times as many dental surgeons on duty in United States would have been necessary to perform the same amount of work as was done in Hawaii, yet the enlisted men at the latter place were by no means all cared for, for more than half of the operations reported from there were performed for the men of four companies—less than 250 men. From this it is evident that the one treatment a year for each man is not sufficient, and sixty dental surgeons cannot render adequate service to eighty or more thousand soldiers.

In his next report the Surgeon-General says:

"Attention is invited to my report of last year with reference to the inadequacy of the number of dental surgeons now authorized by law if a serious attempt is to be made to furnish dental service for the army.

"Since the employment of dentists was authorized in the act of February 2, 1901, numerous bills have been introduced in Congress looking to the permanent organization of the Dental Corps of the army, given the members of this Corps various grades of rank. All bills introduced

to date have been objectionable in one respect or another. During the last winter this office was called upon to give an opinion as to the needs of the army with reference to a permanent dental organization. Before giving an opinion on the subject all the claims and recommendations that had been made to date for the improvement of the dental service were taken into consideration, and it is believed the bill proposed by this office for the commissioning of the dental surgeon will meet the requirements in every respect and give to the army an efficient dental service.

"The bill submitted recommends that there shall be attached to the Medical Department a Dental Corps which shall be composed of dental surgeons and acting dental surgeons; that the original appointments to the Dental Corps shall have the same official status, pay, and allowance as the dental surgeons now authorized by law, and that after three years such acting dental surgeons shall be eligible to appointment in the regular Dental Corps, after passing in a satisfactory manner an examination prescribed by the Surgeon-General of the army. After passing this examination an acting dental surgeon is commissioned in the Dental Corps with the grade of first lieutenant, and shall have rank immediately below all officers of the Medical Reserve Corps, and the pay and allowances of dental surgeons shall be the same as those of first lieutenants, not mounted, including the right to retirement on account of age or disability; and the time served as dental surgeons, acting dental surgeons, or contract dental surgeons shall be reckoned in computing the increase service pay of such as are commissioned in the regular Dental Corps. The recommendation also limits the number of dental surgeons to sixty.

"The bill proposed by this office was accepted by the representative of the National Dental Association, and at the time it was recommended to the Secretary of War the then Surgeon-General of the navy agreed to support a similar proposition for the organization of a Dental Corps in the navy.

"The favorable consideration of the Secretary of War is requested for this bill, which is believed to contain everything necessary for the organization of an efficient dental service."

Officered Corps Established.

During the last days of the sixty-first Congress a bill providing for a commissioned status of three grades for the Dental Corps was attached to the army appropriation bill and passed the Senate. In the Conference Committee of the two branches of Congress the grades of captain and major were eliminated from the bill and it was made to read practically as was recommended by the Surgeon-General the

previous year. Sixty commissioned dental surgeons, however, were allowed and as many acting dental surgeons as were necessary, but not to exceed, both commissioned and contract men, one dentist to each one thousand enlisted men. It became a law March 3, 1911, and thirty of the old corps were commissioned in June—one having been found physically disqualified for appointment.

Under the new law the examinations for entrance to the Corps were to be conducted by a Board consisting of one medical officer and two dental surgeons, and regulations have been issued to the effect that should more than one Board be convened at the same time one of them would be designated by the Surgeon-General as the *Central Board,* whose duty is to prepare the questions for the examinations held by the various local Boards. The extent of the theoretical examination was reduced considerably. Anatomy, physiology, and histology were grouped in one paper of ten questions whereas in former examinations they were separate papers of ten questions each. Chemistry, physics, and metallurgy were grouped and cut down from ten questions each to ten for the three subjects, while dental anatomy and physiology and orthodontia were omitted entirely. The local Board rates each candidate on the oral examinations and on the clinical work but does not rate the written answers. All papers are sent to the Central Board where the written work is rated and the candidate's figure of merit is made from all marks of both Boards. Examinations have been held in April and September each year at West Point or Fort Slocum, New York; Columbus Barracks, Ohio; Jefferson Barracks, Missouri; Fort Logan, Colorado and Fort McDowell or Letterman General Hospital, California. Two candidates were successful in the 1911 examination, fifteen the next year, eighteen were admitted to the Corps in 1913, and eight in 1914. During that time one commissioned dental surgeon retired, two resigned and three or four acting dental surgeons had their contracts annulled either at their own request or for the good of the service. In December, 1914, two of the acting dental surgeons having served as such for three years, as required by law, were eligible for the examination for commission. Boards for this examination were constituted as those for entrance to the Corps—*i. e.,* a medical officer and two officers of the Dental Corps. These Boards were directed to prepare the questions and to give each question a certain value depending upon its importance. The subjects given were: Administration, which included: 1. Army Regulations so far as they relate to the Dental Corps of the army or to the dental surgeon as an officer of the army, Manual for the Medical Department so far as it relates to the Dental Corps, and Manual for Courts-Martial; 2, Oral Hygiene; 3, Orthodontia; 4 Opera-

tive Dentistry, including recent progress in etiology, pathology, therapeutics and operative methods, and 5, Oral Surgery including recent progress in etiology, pathology, therapeutics, and operative procedure. The clinical part of the examination consisted of all classes of operations and laboratory work that might be required in the office of the civilian dental surgeon.

As a result of this examination one of the acting dental surgeons was commissioned in January, 1915, making a total of twenty-eight commissioned officers and thirty-eight or forty acting dental surgeons in the Dental Corps of the army on April 1, 1915.

Dentistry at Penal Institutions.

The Dental Department at San Quentin Prison.

By F. V. Simonton, D.D.S., San Quentin, Cal.

The following is presented to the profession at large with the feeling that it will be of some interest for several reasons. First, because it shows in some measure how great is the need of dental care amongst the class of people from whom the inmates are drawn. Second, because the support which the institution has received from the State authorities is particularly gratifying to our profession as an enlightened recognition of the value and necessity for thorough dental care; and third, because the development of the department in an endeavor to satisfy the demand for dentistry is in some features, so far as I know, unique.

Recognition of the necessity of dental care of some kind for the inmates of various State institutions, asylums, penitentiaries, etc., has for years past led to the employment of a State dentist, who visited these institutions from time to time and performed what extractions, and conducted what palliative operations his limited time and equipment would permit. That this treatment, although doubtless of great benefit, was not sufficient, was evidenced by the fact that inmates of the asylums were taken to private practitioners in neighboring cities when occasion arose and extra attention at the penitentaries was arranged for by visiting dentists.

The San Quentin Prison was for a long time provided with a visiting dentist of its own. The last man to occupy this position spent one-half day per week at the reservation, performing work of all characters, of first class quality. Regular fees were paid by the prisoners for these services except in certain cases where the Board of Directors saw fit to allow an indigent prisoner certain specified treatment at State expense.

But this treatment was again too limited to meet the requirements and a further development took place which led to the creation by the Board of Prison Directors of a position of resident dentist. The occupant of the position was to be compensated for his services by the State at a regular salary; two-thirds of his time was to be spent at San Quentin

and one-third at Folsom Prison. Services were to be rendered without charge to the inmates.

How the establishment of this position came about is rather interesting. Dr. R. A. Day, a personal friend of Jas. A. Johnson, then Warden of Folsom, made a number of calls of a social nature at that institution. But the fact that a dentist was on the reservation, together with the natural generosity of the man himself, resulted in his social visits being turned into days of strenuous work. The crying need for dental care was so evident that an appeal was made to the Board of Directors to provide for a full time dentist. A compromise resulted in the establishment of an office as specified above. A dentist was engaged according to the terms thereof and commenced his duties at San Quentin Prison, but before he ever had an opportunity to visit Folsom, that is, in less than a months' time, it was so strongly shown that what was needed was two dentists for one institution, rather than one for two, that Warden Johnson, with a statement to the Board of Prison Directors that a dentist was as necessary to the health of the inmates as a physician, secured an "all time" man for Folsom. Shortly afterward a very gratifying appointment of resident dentist was made at Stockton State Hospital. Thus the tendency is shown of ultimate provision for all the State wards.

Conditions July 1, 1913.

The condition at this institution two years ago, July 1, 1913, when a full time dentist was first assigned, was as follows: The equipment provided consisted of a home-made non-adjustable chair, a plain wooden locker, a sheet-iron cuspidor, no dental engine, a few miscellaneous instruments, and significantly enough, a very complete set of forceps. The office was a corner of the operating room of the hospital, bounded behind by the bookkeeper and his paraphernalia, in front by a section reserved for ophthalmoscopic work. On one side was a place used for dressings and on the other side the dentist's locker and the wall of the operating room. Once a week when general surgical operations were performed, the "dental office" was moved out into the hall and practice suspended for the time being.

The condition of the men's mouths was, as might be expected, most deplorable. A large number of them were of the class of people who never receive nor seek dental care in the outer world. Others had been confined for a considerable time when sufficient treatment was not available. Anesthetics were seldom resorted to for extractions or minor operations. Most of the extractions were done with more or less skill by inmates, the more difficult ones being left for the visiting dentist. The innovation here that has been most appreciated was the use of local anesthesia by novocain and N_2O and O for extractions and minor surgery.

What work was possible to be done in the limited time allotted the visiting dentist had been performed and was of first class character. In fact, the service rendered by Dr. T. I. C. Barr of San Rafael, the only work which came under my observation, was very excellent indeed and he is deserving of high commendation for conscientious and capable service.

We had then, confronting us at this time, the task of providing dental care for over 2,000 inmates whose mouths were in a state of even less than average preservation. One of two courses was open, either to satisfy ourselves with extraction of teeth and the relief of odontalgias, which work could be very nicely handled by one man, or we could attempt to clean the "Augean stables." That this task was indeed Herculean is evident to anyone in the profession. That is, an attempt to actually repair every mouth in the institution as well as to call for the constant increase in population, anticipated an enormous labor. Yet certain factors in this particular case would lead any conscientious man to adopt the second course. First, because unlike any other clinics, those conducted at asylums for the insane, the army and navy clinics, or public clinics, our clientele could receive only that attention which was provided at the institution. Those patronizing the other clinics could, that is, they had the privilege, and it was possible for them to receive other care. Secondly, men are confined here in some cases for long periods of time and it is no more than right that their health should be cared for during their incarceration; that is, even if imprisonment is considered in the light of punishment, it is not just that it should include a detriment to the health of the individual.

Therefore, the ideal of providing dental care at this institution has been as indicated above and although perfectly adequate service is not provided at the present time and may not be for some time to come, yet we have the satisfaction of feeling that it is being more nearly approximated all the time and in looking back, that some considerable improvement has been made.

What progress has been attained has been done merely by utilizing what we had at command and adding to it whenever possible.

Conditions at Present.

At the present time the dental department comprises three offices and a laboratory. It is in operation seven days per week. Work is conducted by one dentist and nine inmate assistants.

The three offices cover respectively 12′ x 12′; 11′ x 11′; 8′ x 23′ and the laboratory 20′ x 10′.

The main office is equipped as follows: Diamond chair, fountain, cuspidor, electric engine, dentiscope, bracket table, electric switchboard

and accessories, air compressor, gold annealer, cautery, antrum lamp, electric sterilizer, spray bottle warmer, instrument table, N_2O and O Teter No. 1 outfit, and all necessary instruments and materials. It is operated by the dentist and chair assistant. The dentist's hours are from 8:30 A. M. to 4:00 P. M. Work of all kinds is done; extractions, fillings, cement, amalgam, gold, synthetic porcelain, dentures, etc. He is helped by a chair assistant who also handles two or three patients a day during odd hours. The bookkeeper is also quartered in this office. He keeps a record of every operation performed, charts of the condition of the men's mouths, makes out the daily appointments for the entire force, prepares estimates and requisitions, keeps and distributes stock, etc.

The second office is equipped with three "home-made" chairs and three sets of instruments. A first and second assistant operator conduct two of these chairs from 8:00 A. M. to 4:00 P. M., handling seven and eight patients each day. The third chair is used at odd times by the chair assistant of the main office.

The third office is screened off into two divisions. One part is used as a waiting room and in the remaining portion are placed two home-made chairs at which two men perform prophylactic work daily from 8:00 A. M. to 4:00 P. M., handling seven patients each per day.

The laboratory is equipped with every machine and device necessary for the performance of any mechanical dental operation in addition to which are many improvements designed and constructed at this institution.

This equipment includes two electric lathes, vulcanizer, vacuum casting machine, die plates, shell reducing machine, blowpipes, air compressor, flask rings and all necessary instruments and tools. We have our work benches and lockers arranged in sections so that all material and instruments required in each different operation are contained directly under the section of the table on which the work is performed. The sections are as follows: First, section for mixing plaster, making casts and trimming models; second, section for heating water and vulcanizing; third, section for packing plates; fourth, section for finishing and polishing dentures; fifth, section for moulding and casting, for die and counter-die work; sixth, a separate bench for gold work. Three laboratory men are engaged constantly here from 8:00 A. M. to 4:00 P. M.

Inmates as Assistants.

A few of our assistants had some experience in dental work before being confined here. None were graduate dentists. The majority, however, have received their training here; consequently part of our

work is educational in character. Again, in this case we have merely done the best we could. It is obvious of course, that the work of novices could not be of the very highest character, especially at first, but by watching them constantly, helping when necessary, examining all the finished work, and making operations over whenever not up to standard, we have been able to accomplish an amount of work far surpassing that which one dentist alone could do and at the same time we have avoided inflicting any damage. The training of men to be operators is thorough, stages as follows: first, prophylactic work; next, chair assistant; then permitted to perform plastic operations under supervision and improvement encouraged and advanced operations assigned as quickly as capability is manifested. Instruction is rendered verbally; text books are provided for reading and reference. Laboratory men are similarly trained in that department, advancing them through the simpler to the more complex work.

Competition For Prize.

At the present time we have a competition on between six of the men for a prize, requirements as follows: Compound impression of edentulous case. A soft metal tray is then to be moulded to cast from this impression, muscle trimmed, a second "Greene" impression taken, cast made, hollow tin model poured, and a full vulcanite denture constructed on this model. The man submitting the best casts, tray, tin model and denture wins the prize. These competitions are outlined to carry the men through all stages of laboratory work. The assistant chair operators are encouraged to participate in order that they may receive a training that can be practically utilized when they are liberated.

The men manifest great interest and work industriously. From time to time practitioners are invited to visit the institution and demonstrate various kinds of operations.

General educational work is being conducted at the prison under the supervision of the Chaplain and Educational Director. A number of courses are conducted by the Extension Division of the University of California. Our assistants have availed themselves of this opportunity to study Spanish, music, agriculture, etc.

Routine Treatment.

The routine treatment of cases is conducted as follows: Every man who enters the institution as well as those already here, receives a thorough dental examination. The condition of each individual tooth as well as the general condition of the oral cavity is recorded on charts devised for the purpose. Additional space is allowed for records of subsequent operations performed. At the time the examinations are con-

ducted, lists are prepared of dentures, fillings, extractions and prophylactic treatments required and appropriate service rendered each individual in due course of time. For men already here service is rendered according to priority of application, except in cases of extreme urgency. Dentures with clasps, vulcanite, cheoplastic, aluminum, fillings, cement, amalgam, gutta percha, synthetic porcelain and extractions are performed free of charge. Where gold is used as in crowns, bridges, and gold dentures the men are charged for their material, except in certain indigent cases where materials are supplied by the State. Authority for the performance of such work is granted by the Warden who has specified the following cases as deserving:

1. Extreme urgency.
2. Mutilation in the prison.
3. Life termers.
4. Those who have rendered meritorious service to the prison.

Appended herewith is a copy of our monthly report showing the amount and nature of work being done.

An article of this character would hardly be complete without some mention of the relation of dental abnormalities to criminality. Lombroso includes amongst his various physical stigmata of degeneration such dental defects as small, peg shaped or missing lateral incisors, prominent canines, large central incisors, supernumerary or malposed teeth, prognathism, etc. While it is indeed true that such cases are indicative of atavistic physical tendencies yet these factors are of so small consequence when compared with the vast number of physical, both anatomic and pathologic, mental and moral delinquencies which may contribute to or cause crime that it hardly seems that observation of these defects would have any more than confirmatory value.

I have not noticed, however, in the large number of cases that have passed through my hands here that signs of dental atavism were any more frequent or marked than we are accustomed to find them in patients outside.

Monthly Report—April.

SAN QUENTIN, Cal., May 1, 1915.

Calls on Dentist	1710
Cases Treated	1178
Daily Average Calls	57
Daily Average Cases Treated	39
Cement Operations	83
Amalgam Operations	110

Gold Operations	12
Porcelain Operations	11
Crowns, Gold	13
Crowns, Porcelain	5
Bridges	4
Dentures	46
Devitalizations	44
Root Canal Operations	46
Treatments	334
Oral Surgical Operations	7
Extractions	133
New Men Examined	110
Remarks: Scaled and Cleaned	330

F. V. SIMONTON, Resident Dentist.

Dental Society Organization.

The Study Club as a Unit in Dental Society Organization.

By C. S. McCord, D.D.S., Seattle, Wash.

I am going to talk to you not as to the past masters of dental organization, but as plain dentists, as units in the organization, as individuals of the rank and file.

I shall begin with the fundamentals of organization, with the A B C of co-operation, with those processes which demonstrate the power of the aggregate over that of the unit.

Without organization the profession of dentistry would still be in its swaddling-clothes. Without organization all professions, all business, affairs of State, labor conditions would indeed be in a chaotic state.

Organization is the magic wand that transforms chaos into order, that makes fertile the desert fields, that brings vision to the blind, speech to the dumb, and makes of the nonentity a genius.

The meaning of the word organization is efficiency; efficiency spells progress.

That old watchword of Liberty—"United we stand, divided we fall" must needs be revised, for it is but the memory of a restless past when a man struggled even to live.

"*United* we progress, divided we digress" is a slogan adapted to modern conditions and indicative of facts as we meet them in these days of strenuous effort.

Concentration is the soul of organization and is the password that opens to us—everything. There is nothing within reason that we may not obtain, no position to which we may not attain if we but organize our efforts and concentrate our energies toward that end.

Consider the birds that ever migrate in a flock, the wolves that forage boldly in a pack, and the fish that go hither and thither in schools. What is the significance of all these things? These are but indications of organization in Nature—organization through necessity. United we live, divided we die.

The humble workman *alone* is ever at the beck and call of his em-

ployer; the humble workmen *united* is a power that makes rulers tremble.

The little ant, by the effectiveness of its organization, is considered the standard of industry.

The hawk seizes upon the fowl that is huddling alone; it is the animal that has wandered from its mates that finds death in the trap or in the claws of the enemy.

So it is ever thus—the *one* who in the egotism of a selfish nature seeks solitude, or deems himself sufficient unto himself, is the *one* who meets disaster or who gets *least* of the good things of life.

All Nature is organized—The human body with its most wonderful mechanism and control; the celestial bodies, as they traverse their paths year after year; the earth in its relation to the sun; the planets in the exactness of their movements, and even those tramps of the sky, the comets, whose visits are timed to the minute.

In view of our environment; in view of the fact that there would be no *system*—no *order* in our universe; more, that there would be no *universe,* except through organization of the very highest degree; is it not the *natural* thing to do—rather, is it not the *only* thing to do—in order to obtain the *best* that dentistry has to offer, that we get together, think together, and work together?

Working with your fellows begets enthusiasm. Enthusiasm is contagious and spreads quickly. Enthusiasm begets mental competition; mental competition begets initiative, and initiative spells progress—and the world moves.

The dental profession is made up of all grades of dentists, the average of which is always less than that of the best individuals. The average intelligence of any aggregation of men is that degree which lies between the wise and the—least wise.

The only way to raise the average in the dental profession is not to lessen the responsibility of each man, but to increase it—to educate the poorest, the least efficient man, up to the level of the present most efficient, and the most efficient of to-day to a higher and greater efficiency.

To attain that end, the Dental Society was formed and has been slowly advancing in a persistent and consistent way, ever progressing—slowly but surely, establishing principles and fundamentals that have withstood the storms of criticism and, what is more destructive—the waves of indifference that have beaten against it.

The Dental Society is the clearing house of the dental profession, yet its importance to the profession is vastly greater than that of the clearing house to the banking business.

Considering the quantity of available material in the dental pro-

fession, there are too few men engaged actively in the work—too few willing to get in and do a man's work, that dentistry might progress with the rapidity that it merits, yes—that the world demands.

Why is it that there are so many dentists outside the dental societies —why is it that the rank and file of the membership of the dental society takes so little interest in the society as it does?

Why is it that so many young men, or new men in town, join our society, attend a few meetings, then gradually drop away and you see them no more?

Why is it that the older members, those veterans of the profession, in whose years of service in the work there has accumulated a rich experience and whose counsel is needed and appreciated at our meetings—why is it that these men are rarely seen?

Is it that the meetings are not sufficiently interesting to compel the attendance of a large proportion of the membership?

There must be a reason for this dereliction. Where does the fault lie? What is the remedy? Were there but a few men who were negligent in their attendance, the riddle would be easy to solve. But with the great majority of the members never coming to the meetings, it is plain that the society itself and its management cannot wholly evade responsibility.

To the non-member, I will say that the best, easiest and quickest way to the best that dentistry has to offer is through the medium of the dental society. The dental society was organized for your benefit as well as mine; it was organized for the purpose of developing its members that they, through association with their fellows, might acquire the necessary stimulus to do more and better work for the profession, as well as the public.

Post-graduate Study Requisite.

A man may go to college, graduate with honors, practice his profession according to the rules laid down in the text books, and inside of three years his method will be decidedly *passé* if he has not maintained his association with his fellows through the medium of his dental society, or through the dental journals. And right here, let me say, do not figure, when you subscribe for a couple of dental journals with the expectation of saving the two or three dollars over that of the dues of the dental society, that you are developing efficiency as a business man. You are not—you are developing a two or three dollar mentality that will be written all over you in letters unmistakable, and you will attract as your patients people of that same type.

When a man severs his connection with his dental society, it is

lamentable, I care not who he is. When he permits himself to acquire that state of mind where he feels the society can do him no good, *he has become a menace, not alone to the profession, but to the public.* Many a death may be traced to the physician who was not well versed in modern therapeutics; and the responsibility of many a case of impaired nutrition or a more serious condition, is now being hurled at us because, as a profession, we are not in a position to correct the probable cause of the trouble.

The era of oral prophylaxis is here; the education of the school children in the matter of oral hygiene is already creating in the minds of the laity a greater interest in dental affairs. They are beginning to ask questions concerning the best methods of saving their teeth; they are becoming more enlightened every day along dental lines and many of them even now can differentiate between a cavity properly extended and a simple hole in the tooth. This will ultimately make a difference in the attitude of the hitherto indifferent non-member toward the dental societies.

Man should not work alone. It is impossible for a dentist to work alone and maintain that standard of technical skill with which he started. He must mingle with his fellows, either through the dental societies or the journals, or his skill will deteriorate. Man is absolutely interdependent upon his fellow men.

The excuses for a man's refusal to join the society are many and varied; some humorous, some serious, but mostly—vague subterfuge.

It is true that many a potential society worker has been neglected on the occasion of his early visits to the society, and has felt aggrieved—and with some justification; yet, the visitor surely knew that he too had a responsibility he should not have evaded, the matter of making himself known.

I am not excusing any neglect on the part of the membership; its duty to the visitor is plain. The officers at least, if there is no reception committee, should never fail to welcome the stranger and invite his return. Warm up to the visitor—inject a little personality into your greeting, and you will get results that will surprise you.

Essential Elements of Organization.

A noted efficiency engineer states that in the perfection of any organization there are four essentials:

First—There shall be a unit head in supreme command.

Second—The subordinates shall be of line and staff.

Third—The line members shall do many different things.

Fourth—Each staff member shall be supremely skilled as to one kind of activity, and shall at all times aid the line members to the extent required.

In the efficient type of organization the ideal is not to maintain the arbitrary authority of the members of the executive line, but to accomplish the purposes of the organization.

In the efficient type of organization, therefore, the rank and file does not exist for the purpose of carrying out the arbitrary demands of executives, but the executives exist for the purpose of aiding the rank and file to attain the highest point of efficiency. In this type of organization, the executives are regularly and systematically supplied with information, scientific knowledge and counsel from the officers of the staff, specialists and experts whose function it is to determine the most efficient materials, equipment, arrangements, methods and policies.

In the organization of the dental society, the same essentials hold good.

Proposed Plan of Organization for Dental Work.

First and foremost, I would keep an indexed record of every member of the society, each record containing all the necessary information concerning that member that may possibly assist one in determining the personnel of the different committees.

I have always maintained that there is something latent in the mind of every man, and all that is necessary to bring it to light is the proper stimulus.

Let each man of the society do something—put him to work, give him committee work—anything, but get him busy.

Give a man an interest in the business and see how quickly he awakens to his responsibility.

Next—a president should be elected; one who is well qualified to perform the many and varied duties required of him and who is willing to take the time and make the sacrifices that will be necessary for the success of the society work, and, incidentally, when your president has developed into an efficient leader, through whose efforts the society is progressing rapidly, do not interrupt the flourishing organization by electing a new president—continue the old one another year, or even longer, if the machine continues to run smoothly and efficiently.

The election of a secretary is also of prime importance—one who will keep accurately the records necessary to efficient organization work.

The business affairs of the society should be taken care of by a business committee or executive council that the meetings of the society be kept free of those petty discussions that often mar the harmony of the

meeting and take up the time that should be devoted to the program.

The president shall appoint on his staff or cabinet, several men, one for each month of the society year, each of whom so far as possible is especially skilled in one particular branch of dentistry.

The president shall meet with his cabinet at least once a month, preferably the week following the regular meeting, and with them make such arrangements or determine ways and means by which the success of the following meeting may be assured.

As previously stated, each member of the cabinet is selected primarily on account of especial skill in one branch of dentistry. To each member of the cabinet shall be assigned the program for one meeting which shall be along his particular line of work; he shall select from the data on the index records of the society such of the members who are most interested in his particular branch of dentistry, to the extent of approximately one-ninth of the membership and appoint them (appointments later to be ratified by president and cabinet) as members of his committee. He shall as quickly as possible call a meeting of his committee and organize for the purpose of study, experimentation and development of new ideas along its particular branch of work, the sum of its efforts to be presented at the regular meeting and clinic designated for it. Accurate records must be kept of the working of each committee or study club, for no definite progress can ever be determined without records accurately kept.

The president shall meet with the club in charge of the program for the following meeting, at least a week before that meeting, to be assured that the club has its program properly prepared for presentation.

It should be obligatory upon the members to attend their study club meetings. There should be more or less discipline in the management, not arbitrary but nevertheless a certain degree of firmness exercised.

A member should not be permitted to miss two consecutive meetings without a good excuse, and if he misses four he should be automatically dropped from the dental society.

An efficient organization cannot carry along men who will not work; it not only lowers the percentage of efficiency of each man, but it breaks up the discipline of the club; brings about the loss of interest; causes unrest and discord. Better far, to have a dental society of twenty-five earnest, conscientious workers than a society of one hundred and fifty good fellows. More good will result from a small aggregation of workers than a large aggregation of talkers.

Make a membership in your dental society stand for something; make it an honor to be coveted. The membership in a club or society that you have to force upon a man, he does not appreciate. Make him

qualify for membership in your dental club, and then qualify to retain it and you may rest assured he will exert himself to maintain that association.

To the dentists in the smaller towns, if you are too few in number to form a dental society, then form a study club.

If you are close enough to a dental society to attend the monthly meetings then affiliate with the society, and let your study club become a component of the dental society and operate under the guidance of the staff of that society.

If, however, you are too remote from dental centers to take an active part in its work, then let your club work independently.

First—Determine your object, then make your plans covering the methods necessary to attain that object.

Map out your work with the view of accomplishing a certain amount in a given time, allowing ample time for thoroughness, and then make every move count.

Publicity.

Have an efficient publicity committee that will from time to time inform the public of the work of the society. Always have placed, the announcement of the monthly meeting and the program. At the proper time let the people know that the Dental Society is holding special clinics for the benefit of its members; that the Dental Society stands for the highest qualifications of its members; that the Dental Society is doing this, that and the other thing, for the benefit of its members. The inference is plain—the public will soon appreciate the fact that the members of the dental society are receiving the benefit of the most modern thought and invention and govern themselves accordingly. Keep the publicity work, under the caption of Dental Society; every week or two have short articles on the new discoveries or interesting facts about the mouth or teeth, etc., etc., but always and forever keep the Dental Society in the mind of the people. Keep at it until the name Dental Society and Modern Dentistry become synonymous.

Post-graduate Work Controlled by State Society.

It should be the duty of the State or County society to act as sponsor for all the different courses in advanced and special work when properly presented, that are being given with increasing frequency nowadays. The society must recognize the fact, however, that these courses are possible only through the delinquency on the part of the society itself in not supplying the men with the newer information and modern methods that it should, and really its only reason for existence, and that the men in the earnestness of their desire to learn

are greedily swallowing the bait offered by almost any faker or incompetent who chooses to exploit them.

Let me repeat, all post-graduate work should be under the auspices of the State or component society, and those courses open to all members who may care to subscribe. The society should not wait for the arrival of some itinerant, but of its own initiative reach out and secure for its members the best that the profession has to offer.

Harmony.

And last yet not least, it is immaterial how efficient an organization may be from a technical viewpoint; it is immaterial how carefully the details of construction and of management have been attended to, there is one factor that is absolutely essential to the success of a dental organization and that is—Harmony.

Adverse comment, except in the rarest cases, is positively contra-indicated. We must ever bear in mind those words of the Master, "Let him who is without sin, cast the first stone." Fault finding, picking flaws, or "knocking," if I may use the word, the services rendered by a fellow practitioner not only makes *impossible* the harmony that must exist in an efficient dental society, but it creates in the mind of the fault finder himself a condition that renders *him unfit* as a unit in such an organization.

As oil is essential to a smooth running machine, so is the oil of a human kindness and good will toward your fellows essential to the efficiency of a dental society.

Development of the Dental Service in the United States Navy.

By Emory A. Bryant, D.D.S., Washington, D. C.

The establishment of dental service in the Navy has been accomplished by progressive stages attended with the usual caution of the executive branch in proposing, and Congress in enacting legislation which would add another unit to the vast and constantly increasing system of governmental activities.

That dental service was a necessity had long been recognized, and efforts to procure legislation in its favor, appearing occasionally for possibly the fifty years preceding 1894, have been constantly and insistently made since that year, until legislation establishing the present dental corps was finally obtained in August, 1912. The delay in the enacting of this legislation was due to a lack of unanimity between the representatives of dental organizations and those of the Navy Department, rather than to any disposition to prevent legislation.

The following memorandum under date of April 26, 1902, gives the details of the preliminary experiment in naval dental service:

"Referring to the inquiry from Congress regarding the employment of dentists in the Navy the records of this Bureau show that on January 10, 1894, Surgeon Stephen S. White recommended that the Training Station, Newport, R. I., be allowed an additional Apothecary, who should be a qualified dentist. This letter was referred to the Bureau of Medicine and Surgery under date of January 19, 1894, and returned to the Bureau of Navigation with the recommendation that the suggestion of Surgeon White be carried out."

"E. P. Harrison, Apothecary," was the enlisted man first assigned to dental duty in the Navy as above suggested.

From this beginning the records of the Navy Department show that the demand for and enlargement of such service has been continuous, supported always by recommendations to Congress that a dental corps be established as an adjunct of the Medical Department.

In the early years dentists were enlisted in the Hospital Corps for general service, having the same status as other enlisted men, and then specially detailed for dental duty at the various stations in the United

States, foreign possessions, and on hospital ships. These men were graduates of dental colleges or had had special training in dentistry. This arrangement was not particularly satisfactory but worked well as a temporary expedient and the service obtained was fairly efficient.

Further recommendations were made in 1902 that a law be enacted authorizing the appointment of fifteen dental surgeons, with the rank of ensign, and again late in 1903 and early in 1904 that a dental corps and the rank of acting assistant dental surgeon be established. A measure giving three grades of rank was presented but later withdrawn owing to representative agents of certain dental organizations attaching a provision for the appointment of dental surgeons in the Medical Reserve Corps.

The present dental corps was established by a law enacted August 22, 1912, which also specifies that after August, 1915, members of the corps who have served two or more years will be examined for promotion and if found qualified will be recommended for commissions as assistant dental surgeons subject to appointment by the President and confirmation by the Senate. When first appointed, candidates receive the rank, pay and allowances of an assistant surgeon of the Medical Corps. Twenty-eight dental surgeons comprise the present corps.

The duties of dental officers are set forth in the following instructions:

"Dental officers are by law a part of the Medical Department of the United States Navy, and are required to serve professionally the personnel of the naval service and to perform such other duties as may be prescribed by competent authority.

"The regulations provide that the professional services of dental officers shall be available only for officers and men on the active list of the Navy and Marine Corps, and such services are restricted to those measures which will most effectively and economically preserve the teeth of the personnel and insure physical fitness. The department has construed Article 2991, Navy Regulations, to apply to and include officers and men of the Naval Auxiliary Service.

"Prosthetic procedures, such as gold, bridge, or crown work, are not contemplated as a part of the work of a dental officer."

These duties and the class of work to be performed will be enlarged upon as soon as practicable. The equipment at the present time is being enlarged to meet the requirements and conditions confronted as rapidly as is consistent with the number of dental surgeons employed.

While some 60,000 men constitute the personnel of the Navy, constant discharge of men from the service and the enlistment of new recruits to take their places make a continuous flow of patients, and keeps the proportion requiring services at about the same ratio. As about 90

per cent. of the personnel have defective teeth or need dental treatment, it will be readily seen that the time of the dental surgeon is well occupied with even the restricted class of work now being undertaken.

With further development it is hoped that this service may be a great aid in making our Navy more efficient through the improved health of our men.

Cut No. 1. Dentist's office, Navy Yard, Portsmouth, N. H.

Cut No. 2. Dentist's office, Navy Yard, Washington, D. C.

Cut No. 3. U. S. Hospital Ship *Solace*.

The Unpardonable Sin.

By John T. Grant, D.D.S., Martinez, Cal.

Possibly the most contented human temperament is that one which agrees complacently with all existing laws, usages, ethics and esthetics as he finds them, with no desire to modify or mutilate them, for—what have they ever done to him? Unfortunately or otherwise my temperament has never been content to keep company for long with such a one in silence. From my point of view something in my bailiwick has always needed fixing and while I have endeavored not to be bellicose about it, I have usually shown my willingness to see it fixed. Realizing that this mental attitude is not always a popular one, should you, after hearing what I have here to offer, choose to classify it as an albino or even a blue-baby offspring of therapeutics and hygiene, a kind of pharmaceutical hybrid, I shall take no offense, agreeing without argument, that

"I am a kind of farthing dip,
Unfriendly to the nose and eyes—
A blue-behinded ape I skip
Upon the trees of Paradise.
At mankind's feet I take my place
In solemn sanctimonious state
And have the air of saying grace
While I defile the dinner plate.

Yet still about the human pale
I love to scamper, love to race,
To swing by my irreverent tail,
All over the most Holy place.
And when at length—some golden day,
The unfailing sportsman—aiming at
Shall bag me, all the world shall say,
'Thank God and there's an end of that.' "

A physician of some eminence has said that all disease has its origin in one of three causes, namely, fear, poverty or the abuse of sex. Doubt-

less while each of these is *particeps criminis* to the general result, it is not clear to me, how any contortion of the reason or imagination can attribute to these three things all the credit or all the blame. Like the star performer in a Spanish bull-fight, the physician seems to have been led aside from the main issue by the mere waving of a red rag.

That fear is a prominent factor in disease no one doubts and it is evidenced in part by the fact that several cults, having their birth in the last of the 19th century, their avowed purpose and end being the imparting of health to the human organism, have made fear-killing their most important occupation.

If the abuse of sex seems to eclipse all other causes it is not alone in its glory. Beyond doubt it works overtime laying itself liable to the just accusation of disloyalty to the union and regardless of your views on economics you will admit that union labor has its place. If the abuse of sex wins a prize as a cause of disease, what of poverty? Let us make a few comparisons: A Titanic settles beneath the waves and for a day international heart-beat stands still and while my remarks are not intended as a "spiel for the 'Drys'," it is not irrelevant to my comparison to state that a Titanic might sink every day in the year, without taking the appalling annual toll of human life, attributed to the abuse of alcohol. And yet there are enemies more pernicious than alcohol, for they enter the Holy of Holies under the guise of friendship. Many millions of belligerents fly at each other's throats and in an incredibly short time the world is semi-suffocated by the stench of a million human forms decaying—the maddening, staggering stench of a million dead. The world stands aghast at the appalling, unprecedented sacrifice but Nature, without remorse, swinging her clock-like bludgeon mercilessly, has chosen this method for mauling into form the larger, better, more philanthropic, more courageous intellect of nations yet unborn. This is the price which the world is paying for the pre-natal education of peoples yet to be, who in their retrospection will look upon this slaughter for what it is, namely a most natural incident in the evolution of the race.

And what has this to do with poverty? In comparison listen. Can you hear the clock? At every other tick of the clock a baby dies from some preventable disease. 40,000 babies every 24 hours. 1,200,000 babies every 30 days. Nearly 15,000,000 babies every year. WHY? Impure milk—insufficiency of nourishment, warmth and care and in these abiding places of poverty this death rate is doubled when families are considered as a whole. In granting a prize to poverty, as a cause of disease, may we not, in comparison, justly overlook the comparatively in-

significant sacrifice of an occasional world war? And yet poverty is but one of many influences leading to "The Unpardonable Sin" to which I am about to call to your attention.

The Unpardonable Sin.

"The Unpardonable Sin" was suggested as a fitting title to my remarks, by the statement of an internationally-known author and lecturer on ethical subjects, that "The Unpardonable Sin" is the doing habitually, of anything which stands in the way of one's best development; but it is well to bear in mind that Nature makes no distinction between ignorance and ignominy for poison kills as mercilessly by accident as by murder and suicide.

Criminalized advertising capitalizes and profits by the ignorance of the laity to an extent that is appalling. Pause by any druggist's window and read, "NG tablets; take one to-night, you will feel better in the morning," and so you may but beware of the other mornings yet to come when the cumulative effect of many NG tablets has you clutched. Again "Take Fadlereka and eat anything you please" and so on *"ad no endum"* from the products of Eli Silly to Papayans—Hell. This list is limitless and each and everything on it is a delusion and a crime. Crime? Call the police! Present the matter to the Grand Jury! Appeal to the Legislature! Oh, what's the use? How can you convict anyone of stealing pork when every living mortal has had a piece of the pig? The laity does not know and many in the medical profession seem indifferent to the fact, that any dosing habit must have a permanent ill effect upon its victim. So long have we breathed this atmosphere of ignorance and indifference that we have come to regard these almost universal abuses of the body as ineradicable facts of our civilization.

Grandma advocates the drinking of water in which the asparagus was cooked, because it "works on the kidneys," as she says, ignoring the fact that the normal kidneys *need* no work upon it.

Many defend the habitual use of liquors with meals and the universal "small black" and peptonized chewing-gum after, as aids to digestion, losing sight of the fact that the normal digestion *needs* no aid and that gum and gumption cannot keep each other's company half way between meals. Persist in the habitual use of cocoa, even of the late Mr. Fill-up's indigestible variety and you will eventually find your kidneys "out of kelter." "The Boston tea-party" was a good beginning but the participants were too near-sighted or lost their "pep" too soon. Had all subsequent cargoes been treated in a like manner the western world would have received a service of incomputable value. If it be true that only the good die young, heaven forbid that I should influence you to

enter that class, thus endangering your longevity, but the word "habitual" is the keynote of the warning I would sound. If your system refuses to be happy, without an occasional celebration or "stew" of one kind or another, you will find it less harmful to "go to it," get it over with, get it out of your system, forget it for a period, without learning to lean on it as a daily necessity.

Liver Regulators.

Stimulants, however, stand not alone. Doughnuts, such as "mother never made," are prone to plot and execute semi-secret crimes, more pernicious and far-reaching than the crimes of snuff and stogies, indicating that the so-called "liver-regulator" would never have been born, had not some "irregulator" been first thrown into the intricate mechanism of our human machinery.

A lady who, some years ago, placed her faith in Mandrake pills and began by taking a quarter of one pill, tells me that to-day it takes eleven pills at one dose to "produce any result." Soon she will be in the same class with Mike, who said, "Doctor, I have had no result from your box of pills I tuk but I belave I will when the kiver comes off."

Tickle your liver for the first time ever so gently, with a so-called liver-regulator and it laughs with hysteria and you say, "How well I am," but do not forget that from each attack of such hysteria a reaction of liver-lethargy is sure to follow and that each succeeding spell of induced happy hysteria of the liver, must be produced, as everybody knows, by a more violent tickling than was required to produce the spell preceding; and though careful living in other ways may postpone the day the handwriting is on the wall and the time cometh when all the liver-tickling which you do, even with the aid of your physician and his associates, will fail utterly to make your liver even smile and the end is "slow music and sweet violets."

Is there a remedy? Most assuredly! Nature's only beverages are milk and water; include soups and fresh fruit juices if you wish and eliminate all others. In the matter of food "Eat to live" *first,* and you will "live to eat" much longer and there will be no need of anything other than saliva for the "washing-down" process, and he who depends alone upon his saliva will never have any occasion to even coquette with so-called liver-regulators. Cocktails and high-balls which spur the appetite for food also spur the appetite for other things.

Abuse of Sex.

Never would there have been abuse of sex any more than we find it among birds at nesting time, had not the great trinity of Mumm's, Mocha, Meerschaum and their illusion-building similars first

"tee-ed-up" the human body to where it demanded abnormal expression and it is not impossible that father's well-seasoned pipe and mother's habitual third cup of coffee have *pre-natally* laid the foundation for the excesses and frailties of son and daughter.

What then is the Sin Unpardonable? It is the habitual prostitution of the digestive tract. If time shall change this one unparalleled violence, eventually "Fear, poverty, the abuse of sex and the apothecary will disappear and ninety-nine doctors and dentists in every hundred will be out of a job." But I would not presume to set the pace for anyone, for in reality the old chestnut, "Nothing succeeds like success" is true and our ideas as to what constitutes success may be at variance, so, finally, each one of us must,

"Do what his manhood bids him do.
From none but self, expect applause.
He noblest lives and noblest dies,
Who makes and *keeps* his *self-made* laws."

Thus it is doubtless a wise provision of nature, that within certain bounds set by civilization, every individual has the privilege of "going to the devil" in his own way, setting his own pace, for by this method the fool-killer knows definitely who to kill and makes no mistakes.

In this *enlightened* age, while almost countless thousands of human beings are being blown to hash and millions of helpless innocents are being poisoned with putrid milk and other things, civilization looks complacently on as though half enjoying the spectacle, and with seeming doubt and indifference as to whether she really cares to change her ways; so in view of the existing conditions my topic may not be wisely nor popularly chosen, yet I may be consoled in some measure by the facts first, that in spite of the snail pace of civilization, facts eventually triumph and the late Mr. Gallileo, once the most unpopular of mortals, is to-day mentioned, when mentioned at all, in quite polite and refined company; and second, those of us who have not the slightest intention of learning to forego our morning "eye-opener," of whatever variety, may help to push civilization one notch forward, by being living and dying examples of our follies on that needlessly premature day when the doctor is prolonging our agony by the use of oxygen.

Someone who suffers occasionally with a severe ache, of unknown origin, in the head or elsewhere and who depends at frequent intervals, upon a liver-regulator, asks and answers, "What! give up all these simple, harmless helps and pleasures for the sake of perfect health? I would rather die!" To which there is but one reply, namely, "We may choose that which we would 'rather.'" When the end is near, let us re-

member, if we can remember anything, that we have had our choice and let us be content. If we are tempted to pity ourselves as martyrs to our own temperaments, let us "forget it," for martyrs are like Riley's "goblins and elves and squigecum squees 'at swallers their-selves," "there ain't no such animals."

Even the man, Jesus, standing at the outer gates of Jerusalem for the last time, must have seen two paths laid out before Him. He could enter the city to His certain death or He could turn aside into paths by Him untrod, renouncing passively by negation all that He had thus far stood for and save His life. History echoes His decision, "I would rather die," and likewise every human being chooses that which he would "rather," that which when finally analyzed, he believes will contribute most largely to his own contentment. Let us not hoodwink ourselves into the delusion, that our pet follies are harmless but rather exercise character enough to look the matter squarely in the face, choose between "lush" and lozenges or longevity and willingly pay the price.

Pills.

Humanity would resent the accusation that with a few rare and isolated exceptions it is in the clutches of some drug habit and yet the evidence is overwhelming. Forgetting for the moment all our little pleasurable vices, bear with me a little longer. In 1913 the world's output of pills, conservatively estimated, if placed in a line with their surfaces touching, would reach more than ten times from the earth to the moon or would girdle the earth more than one hundred times at the equator. This takes no note of the rivers of tinctures, emulsions and solutions nor the countless tons of powder and other preparations poured into the delicate human mechanism with the hope of eliminating some of the results of the follies of our civilization.

The Foundation of a Drug Habit.

In my operating-room twenty-four years ago, a well-dressed stranger who still lives, took from his pocket a large cooking-spoon, poured into it more than a heaping tablespoonful of the sulphate of morphia, surrounded it with water, boiled to solution over a few matches, drew all of it into a large abscess syringe and screwing a hypodermic needle in place, injected the whole solution into his arm. Allowing one-eighth of a grain to the dose, he had taken between 400 and 500 doses in one. When I asked, "Shall I call the coroner?" he said, with a saddened, hopeless smile, "Don't take the trouble, I just do that to steady my nerves," and as we stood there his trembling hand grew as steady as my own, and he said that he made a practice of steadying his nerves by this process about six times in twenty-four hours.

His first dose was one-eighth of a grain taken to allay the pain of rheumatism. A few years later this victim threw off the habit by his own will, which fact would tend to indicate that no case is so bad as to be known to be positively hopeless. If this case seems exceptional it has much aristocratic company.

A friend of mine and yours recently advised me that after midnight in a spirit of banter, he had drunk eleven large-sized coffee cups of coffee of the thick almost syrupy small black variety, went to bed and slept like a baby. His interpretation of the incident was either that coffee is harmless or that his is an unusual physique, whereas during the same conversation he told me that following his physician's advice, he had just made a new will as he was suffering from a heart trouble, which might cut him off any time within a year. The truth in his case was that his carburetor had become accustomed to so thick a mixture that he could not see the facts for the smoke, and his speedometer had ceased to indicate.

I also have in mind a life-long friend of exemplary habits. He lived out-of-doors, never used alcohol, smoked only the best cigars and many of them. He contracted pneumonia and was dead in forty-eight hours. From the first he had the best of medical care and nursing and his physicians told me that he had so over-stimulated himself with the "best tobacco" that his system refused to respond to any stimulant and I am advised that many cases of Bright's and diabetes occurring in strong constitutions at a premature age are readily traceable to similar causes.

If my remarks have been rather rambling let them point to one moral: namely, these practical jokes which we are playing on our digestive tract are surely destroying the power of the nervous system to tell the truth. If action would be safe and sane the wires between environment and the brain must be in working order. If the acts of nations, their diplomacy, judgments, conclusions and ultimatums could have had their origin on brains unknown to stimulants, may not many a national calamity have been avoided?

Climate.

"Lastly," as the preacher says, I was advised that if I expected anyone to swallow this pill it would need to be at least chocolate-dipped, so concluding, the dip-dope leads me to warn you of a danger which becomes a menace to health and happiness in the proportion to one's abstinence from it, namely, "climate." Along our coast, the western microbe thrives, most prevalent of course in Central California. Be careful that you are not bitten by him, for the venom works rapidly, and

promptly modifies your hopes and aspirations, your longings, desires and loves of a lifetime. No matter how far away your home may be, nor how far away you wander, when once you are bitten by this irresistible bug, known to us as the *Bacillus Hesperus,* you will turn bacilli until you return to these balmy shores. Yea, those of us who came from afar half a century ago and were bitten (not stung) know whereof we speak. True there are more follies in California than in any other land, yet our people live long. Yes, but it is in spite of our follies rather than because of them. You see there is only one California and we recuperate while we sleep, but as many of our visitors realize, we seldom sleep. Believe me, if you would have perfect health you dare not ignore the matter of climate.

California.

By John T. Grant, San Francisco, California.

*(*Tierra del Copa de Oro, Land of the Cup of Gold.*)

I

From Mexic turbulence and woe
To Shasta's tranquil snows,
From Tahoe's em'rald-indigo
To where Pacific flows,
From rosy, lotus-tinted east
To crimson, Golden West,
There throbs and breathes and laughs and loves
The Land I love the best.
O, California! Best beloved!
Thy joys my heart hath stirred.
I love thee, O, I love thee—yet
Love is a feeble word.

2

Where tower there cliffs more wondrous high?
Where leap there falls more grand?
Thy tree-tops pencil purple skies
As waves write on the sand.
Where blow there blossoms half so sweet?
Where balmy air so pure?

*Copa de Oro—Cup of Gold—Spanish name for our Eschscholtzia or California poppy.

Where breathe there sons of sturdy sires
More fitted to endure?
O, California,—loved the best,
Thy countless joys untold,
Land of the myriad tinted West,
Land of the Cup of Gold.

3

From foreign shores to lands untrod
And ever on with zest,
Our forebears heeded well the call
Of this broad, wondrous West,
Till now there is no "Farther West."
Wealth towers on ev'ry hand,
With gold and grain and garden blest,
We've reached the *"Promised Land."*
Where red-lipp'd sunsets ever kiss
The golden day to rest,
While cups of gold their petals fold
Like tired lids caressed.

4

To-day with open arms we stand,
All nations' flags unfurled,
With loving heart and fervent hand
To welcome all the world.
By war may we ne'er be bereft
Let peace forever reign,
Columbia's puny might hath cleft
A continent in twain.
That peaceful fleets from ev'ry clime
May find a peaceful home,
Forgetting strife for all glad time,
Yea, let the people come.

5

What though our cities reel and rock
And flames sweep them from sight!
We laugh, and rallying from the shock
Rebuild them in a night.
O, dauntless sons of dauntless sires,
By ev'ry blessing blest,
While skies are blue, be true, be true,
To your glad Golden West.
O, California! Best beloved,
Thy joys my heart hath stirred.
I love Thee. O! I love Thee—yet
Love is a feeble word.

Take an old man's advice, "Come west, young man, yea, seventy, eighty, one hundred years young. Transplant yourself to the land where birds nest, flowers bloom, fruit ripens every day in the year—eliminate your pills, powders, plasters, puffs and potions, above all free yourself from your follies, make love every day—all day to—longevity and *live forever.*

What Shall be the Preliminary Educational Qualification for Entrance to Dental Colleges?

By L. L. Barber, D.D.S., Toledo, Ohio.

It was with considerable hesitancy that I acceded to your request to write a paper for this Congress, and whatever else may be said about me, it cannot be said that I chose this subject. The problem under consideration is one that never can be solved to the entire satisfaction of every one concerned, any more than a tariff can be levied upon importations that will be satisfactory to all. The interests involved are too greatly diversified. But from the standpoint of an ordinary dentist, who has a pair of eyes with which to see, a pair of ears with which to hear, and who has made an honest endeavor to make the best use of them, we shall see what we shall see, and hear what is to be heard.

Preliminary Education.

To start with, I know as well as anyone does that there have been and still are men in the dental profession whose preliminary educational qualifications were very meager, and still they are giants; yes, and they would have been giants in any other vocation. Such a man is a genius, and it is not the genius that I am talking about; he can and will take care of himself. Nobody can tell how it comes to pass that men of extraordinary minds and ability are born of commonplace parentage and bred in schools of adversity, away from books and masters. Institutions are not essential to their education. But everyone who observes in a series of years the advancement of men of talent as distinguished from men of genius must admit that such men are rarely produced in the wilderness, apart from the guiding influence of good teachers. And while it is true that there have been and are giants in dentistry, graduated from the school of adversity, it is just as true that there are not as many giants as there would be if the educational requirements were of a higher standard.

It is not uncommon to read an article or hear some one argue that some of our most honorable colleagues came from the lower grades in the most ordinary schools direct to the dental college. Well, what of it?

That is the same argument that has been used since Noah first sighted land, and will be used until the time comes that we may have a uniform requirement for entrance to dental colleges.

As I understand the situation, the entrance qualifications must depend largely upon two things:

1st. What is the finished product to be?

2d. How much and what kind of instruction can be given within a reasonable dental college course?

What Shall the Finished Product Be?

I take it that, on the average, persons who have in the past received diplomas from almost any dental institution in this country have not had the amount of general education that would permit of their getting the most out of their dental course. I mean by this that the person who has a good, general, well-founded education will find it easier to quickly grasp the studies to be taken up in the dental course, more especially anatomy, physiology, pathology, chemistry, etc., than one who has not; and I am sure, other things being equal, that the person with a good, general, preliminary education not only gets a better and broader conception of a technical education in a much shorter time, but that it is certain that he also becomes a broader professional man in general. So, in part, we want the finished product to be a broad, strong, *able man,* of good *principles and habits,* well educated, not alone in dentistry, but along all other lines as well.

The time is at hand when if your child or mine goes to a surgeon or to a dentist for an operation, in view of the advance that certain men and institutions have made, due primarily to the work of men of broad education, and if that operation is not performed on a more safe, sane or sound basis than many of them have been in the past, the operator should be, and I am not at all certain but he would be arrested for malpractice; although whether he could be convicted of murder or not may be still an open question. This I do know, that we must be better qualified in the future than we have been in the past if we expect to stay in the running.

The Dental Course.

The dental course, as it has been given in the various institutions of this country, is so varied that it is almost impossible to get any definite idea of what the colleges do teach. Even the best mentally and physically equipped dental colleges can give no more of a technical education within the time so far allotted to them than would be most advantageous to the public; in the judgment of the writer, not that much.

If my opinion be correct, then it is obviously true that the difference between the ideal finished product and what can be given within a reasonable technical college course should be the qualification for entrance to dental schools.

Qualification for Entrance to Dental Course.

What constitutes "qualification"? It is the state of being qualified by such changes or modifications as will, with the proper kind of instructions on the part of the dental educators, produce the standard desired for the finished product with the least amount of waste energy; and such changes and qualifications do not consist alone in so many counts or units from some high school, no more than it consists of great skill. Some of our educators have thought that the development of great skill was one of the chief ends of education. That has been particularly true of teachers of technical education. Far be it from me to underrate the importance of skill. But overzealous educationists are too apt to forget that the weak, vicious man, in many cases, is fighting single-handed for the mastery over perhaps a score of evil-minded educators. It is not letters, but *life,* chiefly that educates if we are educatable.

It has for centuries been a mooted question whether education can produce character. Some say that character is the final aim of education. Let that be as it may, I say that some attention should be paid to the character of the people who are teaching, as well as the character of the people pursuing education, and any method by which we can protect the professions which come into contact with men and women by some test of character is desirable.

There should be no place, either as teacher or pupil, for those who go through life just lolling around, sighing like the weird exhaust of a debilitated pump. The real stimulative force must live within the inner man. Upon the office wall of one of the greatest educational institutions in this county is this motto: "Light the fires of desire under the waters of the mind and you have the steam of the will." Lack of ambition in any sphere of life means failure from the start. The man who aims at nothing might as well be out of existence.

The most ornery little yard-engine that, with fire and steam, goes snorting about, shifting cars all day, is worth more than ten thousand better built ones that will not take fire enough to generate steam. But you never see any of the little yard-engines out of the yard and on the main track pulling the fast through trains; they are always just yard-engines. So if they both hold fire enough to generate steam, the better-built one does the larger things. Just so with men. Some with good preliminary education may come out of a good dental college very poorly

equipped to practice dentistry. Some who have a poor entrance qualification may come out of a very poor dental college very well equipped. But certain it is, that more well qualified men will come out of any college if they have had a good preliminary education. And when young men and women get into their heads where they can learn the things they do not know, and want to know, they have a pretty fair education.

It may be a very difficult matter to say to aspiring dental students: "You cannot enter here, because you have not sufficient education, or sufficiently strong moral character." I think in an elementary school we have not the right so to do, and because of that charitable view of the matter, many persons come into the dental profession year after year who lack something vitally important, and it is a something that cannot be supplied by the dental college and may not be by the elementary school; but, nevertheless, the consciousness is increasing and the conviction is very rapidly deepening that the dental profession must not be filled with men and women whose standards of education, character and efficiency are not such as will give us the best results.

It is evident that all of the dental schools throughout the country have felt the pressure of the necessity for a high entrance requirement. A boy may go to school to learn to make a living, but he does not go to college for that purpose; if he cannot make a living he has no right to be in college. It is therefore a proper procedure to look at what the dental colleges are doing for those who come to them for instruction.

I have written sixty-five letters to dental colleges and dental departments of universities. I have secured answers from about fifty. This includes the United States, Canada and Nova Scotia.

The findings were not at all satisfactory. In any scheme to fix a standard of entrance we must have the announcements of the different schools to state their requirements as to admit of no misconstruction, a condition that is not true at the present time. The entrance requirements as given in some of the announcements that I have received seem to me to be on a par with some of the statutes in many of the States, not written to be lived up to, but intended to be broken.

After a study of the published requirements, it is my belief that some of the schools are making an honest endeavor to do the very best that can be done under the circumstances. But it is also my opinion that there are schools whose names stand high on the roster of the Association of Dental Faculties who, I fear, do not have the best interests of the public and student at heart. We never can have a just and equitable entrance requirement until such time as every school has such interest unless the whole entrance matter is effectually taken from the hands of the schools.

A plan I am sure that would be welcomed by a goodly number of schools.

I have but to refer to a paper read by Dr. Fred W. Gethro at Ann Arbor, no longer than last January, to show the great diversity of opinion of the different schools as to the necessity of certain studies.

Dr. Gethro's Views.

Dr. Gethro says: "I need only to call your attention to the chart of subjects and teachers published by the Institute some two years ago to illustrate my point. According to that chart, which was made up from the official catalogue of the schools, either one or both of the following conditions was true. First, either dental colleges were doing more teaching than they claim, even to teaching subjects that are not included in the catalogue, or else they have been very deficient in not including some very important dental subjects." And from my study of the catalogue of fifty or more schools I find that what Dr. Gethro says is entirely true.

Dental anatomy is taught in only seventy-five per cent. of our schools. Physical diagnosis, according to the catalogues, is taught in only ten per cent. of some fifty schools.

Further, Dr. Gethro says: "Is it any wonder that we are severely, and I might add justly, criticized by many educators, especially members of the medical profession?"

And may I add that the time is now here when we will be criticized not only by the medical profession, but by the laity as well, for in the light of a broader education the public can no longer be made to put up with anything short of the best and most scientific treatment possible, which I am convinced by a study of the published requirements of the various dental schools is not obtainable in all of them at the present time, according to their catalogues. I know full well that the mere publication on the part of a college that they teach a branch does not guarantee that they live up to it. If all would publish a course of which no one could misconstrue the meaning, and then have some pride in the product turned out, it would be of some considerable value; and, after hearing the deliberations of the American Institute of Dental Teachers and the Dental Educational Council of America at Ann Arbor a short time ago, I am sure that a better condition will prevail on the part of the colleges. I am also convinced that there are men of integrity and education connected with enough of the dental educational institutions of this country to either make the rest come up to a decent efficiency or *get out of business.*

Now, if the schools have been willing to take the step of adopting a four-year course, which is none too much time in which to prepare a student in dentistry, even if he have a good preliminary education, I

say let us give them some method whereby their material may be of a more *uniform* character.

Of one thing I am convinced, and that is that there is no time within the dental course to make up what should be a part of the preliminary educational qualifications.

Eligibilty to University Entrance Advocated.

Universities are the natural and must become the legal sources of public education in this country. All public education should be and must become a state matter. There will come a state of society in which means will be found to make men of learning in a given generation responsible for the system of primary teaching. And upon all matters, such as methods of discipline, text books, courses of study, qualifications of teachers, the method of holding and kind of examinations to be given, the voice of the university will be heard. "The wisest are none too wise among the pedagogics, but they are better counselors than the ignorant."

Quoting from Daniel Cort Gilman's speech:

"The professional schools are everywhere in danger of being—nay, in many places they actually are—places of technical instead of liberal education. Their scholars are not encouraged to show a proficiency in those fundamental studies which experience of the world has demanded for the first degree of arts."

It is well known that some dental schools graduate many young men who could not gain entrance to the arts department of any good university in this country. Is it any wonder, then, that we have quackery in the profession far beyond what should be its just portion?

"The graduate of a few years ago could scarcely enter the freshman class of to-day. His education has come to him very largely through the hard knocks and the trying experience of the making of a career, and yet he is the one who feels more keenly than anyone else the advantages of an all-around education, had only from an all-embracing university. He knows that the student of the present and the future should be left, not to his own ideas of what he needs, not to the narrowing forces of a specialty through the abuse of the optional system, but he should be so broadly cultured and at the same time so practically informed that when he comes to enter a dental college which will take all of his time and enthusiasm from other pursuits, the healthful and never-ceasing influence of the broad and general realization of his universal education will prevent him from ever becoming completely narrow or bigoted. The modern devices for increasing knowledge are now so artful and insistent, the very atmosphere of life is so charged with information as almost to com-

pel wisdom in the intelligent and forbid illiteracy in the stupid. For the youth the public schools have become so powerful and so rich that there is no longer the former need for private schools."

The totality of the aims of public so-called secondary schools and the universities is the harmonious expansion of all human good capacities.

So if what I have said be true as to what the finished product of a dental school should be, and that the dental course in any of the best dental schools does not require more time than is actually required for a dental education, then there is no time in such a course for making up conditions held over from a preparatory course.

Therefore the entrance requirement to dental schools ought to be a certificate of matriculation in one of the standard colleges of the United States, or a certificate of graduation from a standard or accredited secondary school in the United States, or a certificate stating that the holder has the ability and capacity of a college freshman.

With respect to the first suggestion, while entrance requirements vary our colleges are being gradually standardized; so that it would be possible for one who has received his secondary school training outside of accredited secondary schools to gain entrance into a standard college by examination. In this connection it might be well to call attention to the fact that Eastern colleges have united in an organization, which is known as the College Entrance Board. I understand that this board gives examinations for college entrance in various parts of the United States. A certificate from this board might also entitle the recipient to entrance into standard dental colleges. With respect to the second suggestion, graduation from a standard or recognized high school, that school should be one whose graduates would be accepted by any of the standard universities or standard colleges, recognized by or belonging to some one of the college associations of the United States, or by the College Entrance Board.

With respect to the third suggestion, there are men who might well object to going back to complete their secondary school work on the ground that to them such secondary school work is artificial and does not pay for the time and energy that they would have to expend upon it. There are a few such men who may have the breadth of vision, the knowledge and capacity possessed by the average college freshman. I believe that sooner or later psychologists will devise a plan of tests by which the knowledge and capacity of such men might be tested. If so, a certificate from such a board should be accepted.

Therefore, I would suggest that the requirements for entrance to a dental college be not less than graduation from a recognized high school,

or a matriculation certificate in one of the standard colleges of the United States, or a certificate from organizations who are authorized to give examinations and issue certificates of entrance to recognized colleges; that no school requiring less than fifteen units for graduation be considered; that the unit be the one adopted by the National Conference Committee on Standards of Colleges and Secondary Schools, which is made up of representatives of the National Association of State Universities, the New England College Entrance Certificate Board, the College Entrance Board, the Association of Colleges and Preparatory Schools of the Middle States and Maryland, the North Central Association of Colleges and such other associations as appear in the list of accredited schools, published by the United States Bureau of Education.

I would also suggest that no dental school should accept a student and allow him to make up any conditions of his previous course, and that the National Educational Council have charge of the matter of such changes as may come up from time to time.

The necessity for some radical change in the purpose and methods of dental education as commonly understood and practiced in the past is very evident is pressing upon our attention more and more; and we, who make up the body of initiates standing within the portals of the temple, should see to it that this change comes speedily, thoroughly and beneficently.

The Mission of the International Dental Federation.

By N. S. Jenkins, D.D.S., New Haven, Conn.

The founding of this Federation was consistent wth the catholicity of spirit and with the independence and originality of thought and action which distinguishes dentistry among all the various branches of medicine. It was the first attempt to bind together, in continuous and sympathetic relationship all the members of a world-wide profession. It was appropriately born, at the beginning of this century, in generous and enlightened France, among a people ever audacious in humanitarian enterprise and who first dared to dream of the United States of Europe.

Rules and Regulations.

Art. 1. The International Dental Federation was organized by the National Committee present at the Third International Dental Congress, at Paris, in 1900, and was created in conformity with Resolutions 11 and 12, passed by the general meeting on the closing day of that Congress, August 14, 1900.

Art. 2. The objects of the Federation are as follows:

"(a) The acceptance or rejection of invitations made by various countries to hold a regular International Dental Congress, and to fix the date and place where such Congress shall be held.

"(b) To maintain and strengthen the ties that bind the national societies to each other.

"(c) The organization of such International Commissions as it may deem necessary to create.

"(d) In a general way to promote the organization of bodies that will contribute to the advancement of odontological science throughout the world.

"(e) To award the International Miller Memorial Prize."

From the foundation of the Federation, the value of International co-operation was recognized and the members worked together in con-

stantly increasing understanding of their duties and privileges. The various national points of view arising from differences in education and social and political conditions were most interesting and instructive, showing that mutual understanding bred mutual admiration and respect. Something of importance could be learned from every country and a common ground of action could always be hopefully sought and ultimately found.

Various commissions were appointed, among which the Hygiene Commission, the Commission on Education and the Commission for an International Code of Professional Ethics have been especially important and influential.

As an illustration of the work of the Federation, I may cite the meeting of the Hygiene Commission at the Hague in 1913. Reports were received from America, Austria, England, Belgium, Finland, France, Germany, Holland, Italy, Luxemburg, Norway, Sweden and Switzerland. In some of these countries, notably America, Austria, England, France, Germany and Sweden, great progress was announced in school and general oral hygiene and the various methods employed in different countries were described and compared.

The International Dental Federation has no authority to dictate, but only to consider, explain and recommend measures to the dental world, and in this province it has already acted, and will still more in the future act, as an International Exchange, in which every vital question concerning our profession will be considered in its international relationship. There is no other forum where such questions can be so impartially debated or where methods and results can be so intelligently compared.

No man can have been actively connected with this Federation without having had his mind broadened, his knowledge increased, his sympathies quickened, his usefulness extended and his imagination kindled into flame by the vision of what international co-operation may accomplish for mankind.

The Palace of Peace.

Coincident with the meeting of the International Dental Federation at the Hague, in 1913, the opening of the World's Palace of Peace was celebrated. How greatly we Americans rejoiced that this momentous event was made possible through the noble spirit and the splendid munificence of one of our fellow-countrymen, and how ardently we hoped that it marked the end of barbaric war and the settlement by arbitration of all international disputes!

Within a twelvemonth the most awful conflict in all history was precipitated upon a shuddering world, and now, after a year of unpre-

cedented bloodshed and misery, much that is most precious in European civilization has already been lost or hovers upon the very verge of ruin.

But in the midst of this hideous carnage and the passions by which it was bred and has been excused, there emerges one gleam of celestial light. In every warring nation there remains one class which has been dedicated to the service of suffering humanity and which remains true to its traditions and training. Every department of the medical profession, among which our own is peculiarly useful, is engaged in alleviating some of the incomparable misery caused by the war and giving to friend and foe alike its beneficent ministrations. I do not refer to the devoted services of the American Red Cross, whose unselfish achievements are above all praise, but to those among the combatants who keep alive the sentiments and the practice of brotherly kindness and charity amidst the breathing out of threatening and slaughter.

It is with such souls as these that the hope of the future lies, and it is in their name and for their sake that I beg my American brethren to uphold the hands of the International Dental Federation as one of the means to show the way, when peace at last shall come, to bring about conditions under which nations can live together in continuous harmony.

Rulers, diplomatists, soldiers, have not kept the peace, but they who have preserved and not destroyed human life should be first in influence among those who reconstruct desolated Europe.

What is Dental Literature.

By Garrett Newkirk, D.D.S., Pasadena, Cal.

Primarily of course, it is well understood that everything relating strictly to the teeth comes under the head of dental literature. This alone constitutes a great field, that even the dentist possibly fails to comprehend as a whole. Although the teeth are an important part of the animal body, the physician usually gives them but a passing thought. He may examine the tongue and tonsils without knowing whether his patient's teeth are living things or "made on Staten Island." Nevertheless, the teeth have a vital connection with the body, intimate in the mouth, functionally to its remotest part. The little toe is not exempt from the relationship.

The teeth have a wonderful biological history. They have infinite variation natural or accidental. They are subject to influences of destruction that are altogether peculiar to themselves.

Taken in pairs there are sixteen teeth above and sixteen below, each having a distinct typical anatomy—each one a subject for peculiar study.

Scope of Dental Literature.

The natural teeth, their anatomy, physiology, histology, hygienic relations; everything relating to their conservation; all forms of treatment and restoration, with endless detail relating to materials and their manipulation—all is included. The scope of the subject can hardly be imagined even by those who have given to it years of study. Dental literature relates to all this. But with common consent, by the evolution of practice, by natural specialization, dentistry involves more. It has taken from the general practitioner the entire oral field. It is expected, demanded of the dentist to-day that he and he alone shall be the chief authority on the pathology, medicine and surgery of the mouth. He joins hands with the rhinologist, the oculist, the otologist and the general practitioner. Moreover, dentistry extends to relations of art and esthetics; to voice and expression.

In its restorative measures are involved studies of metallurgy; mechanism, intricate, delicate, and the genius of invention.

So much for the special, acknowledged field of dental literature. But having gone so far, we cannot avoid going further. Dentistry shares in common with general medicine all there is of the basal sciences, anatomy, human and comparative; physiology, chemistry, physics, hygiene. Its literature reaches forth to every practical relation with these, also the world of common sense. Is the field broad enough, think you?

Dental Journals and Books.

Dental literature, like other literature, consists of two classes: First, that of current periodicals, consisting of papers, discussions, records, descriptions, editorials. Second, matter supposedly valuable is printed and bound between boards for preservation and convenient reference. This is called a *book,* and assumes to be in some sense an authority upon the subject treated. With books are included volumes of the transactions of various societies.

Books contribute little to the matter of periodicals; journals on the contrary contribute largely to the making of books. Matter intended for a book is sometimes published serially in a magazine for profit or advertisement. But whatever the preliminaries the book should possess certain characteristics.

First.

It should meet a definite need of the profession as a whole or some branch thereof; temporarily at least if not permanently. If only the former it will soon be forgotten, and will exist later only as a curiosity of the literary museum. Most books, however, good at the time of their publication, are likely to be superseded. Treating of methods and processes, they must possess very high value indeed to hold place long. The last word on a subject is hard for anyone to say. A Gray in anatomy, a Gray in botany, a Coues in ornithology, a Black in dentistry, such are figures for the centuries to measure from.

Second.

A book should have originality. The personal equation counts not a little. Something of character goes with it. Consciously or unconsciously one reads between the lines qualities of mind and heart. This involves sincerity, single purpose, and helpfulness.

Third.

A book should present some new truth, or old truths in better form, for instruction and practical use.

Fourth. Wordiness should be avoided. The author should labor diligently; he should take no end of pains to have his expression fit; to find the right word, and to use the least number that will make his meaning clear. His expressions should illuminate and not confuse the mind of the reader. He should try for sentences clear, simple, not long or involved. Even the Apostle Paul could have improved his style greatly in this respect. And I have no doubt that a little humor, if not dragged in by the heels may help a dry subject.

Fifth. Any book worthy of publication should have careful editing, at least reading and suggestion, by some other than the author. No one shall write so perfectly that another far less capable perhaps, may not discover an error or possibility of improvement. Not one word of a book should go unchallenged by the merciless eye.

Jenner worked twenty-three years on his vaccination treatise of seventy pages, giving details of twenty-three successful cases.

Bryant wrote Thanatopsis, it is said, a hundred times. Goldsmith thought four lines an unusual day's work, and had *"The Deserted Village"* in hand seven years. Seldom is good writing spontaneous, or without great labor. Most authors do not take pains—in the literal, true meaning of the term—and one has said. "If you do not take pains, pains will take you."

Sixth. Any book containing matter worthy of reference should be carefully indexed, as to all facts, subjects, individuals spoken of, and authorities quoted. Nothing is more annoying than to want something that you know is in a book yet cannot find, and promptly, because not indexed.

Seventh. Whatever illustrations are necessary to the understanding of the text should be placed in proper relation. But great care should be exercised *not* to over-illustrate, so that the reader is not a reader, but thinks he has it all in pictures while he turns the leaves like the reel of a "movie."

I well remember the first description I read of Taggart's inlay process. There was no picture but of words, so well written by himself that nothing more was needed. I could make my own pictures as I read, and I exclaimed with exultation: *"This is what we've been looking for!"* How much better this than so-called illustrations that we often see of impossible anatomy and appliances that look as if made by a cross-roads blacksmith.

I am inclined to emphasize my positives with a few negatives.

(1) "A writer should *not* permit himself to write hurriedly, without concentration, revision and correction." He should never rush a book into print, until it is as nearly perfect as he could hope to make it.

(2) His sole purpose should be to get at the truth, and get it *to* his readers; *not* in large part to gratify a personal ambition.

(3) It should *not* be written with a view to establish some pet theory of his own, so that facts or views of others are withheld or twisted.

The Periodical.

Young as I am I well remember the period of *one* leading dental journal. In the files of the *Dental Cosmos,* beginning with its mother, the *Dental News Letter,* is to be found the larger part of dental history for seventy years. I have tried to encourage dental students to read these old journals, *Dental Cosmos* and others, in order to learn something of the men who built the profession. There were "giants in those days,"—those of whom our young men know but little. Through the pages of these journals one may trace the evolution of dental thought in its entirety. I insist on giving this advice to students and the young practitioners, even if they pay no attention to it. It is always possible that in some young sprig the seed may sprout and grow to fruitage.

The number of dental journals now printed in the United States is quite beyond my reckoning. Nearly every one is given at a price of one dollar or less. Each is worth what it costs or a good deal more to the subscriber who reads. I marvel not at what they lack but rather at their wealth of content.

But why should there be so many? Will we, should we come to the publication of a great leading journal like that of the American Medical Association? If such an event is on the way it will be, I imagine, a long time coming. There will have to be a great getting together of the profession before that.

The Trade House Journal.

As we know, every leading journal is backed by a commercial interest. Otherwise none could exist with a subscription price of one dollar. Possibly a hundred dentists will be found some day who will donate the price of their Pierce-Arrows to the endowment of an independent journal.

As it is, the commercial and manufacturing house pays the editor and the printer, in consideration of the advertising pages and the reader gets his journal for practically nothing. Of course, in the end, "Jones he pays the freight," as he does the tariff on his tea, unconsciously.

It is inevitable, I think, that in some cases the literary quality of a journal suffers by this arrangement. For example, a man with a fad

who *thinks* he can write, is permitted to exploit his theories, not by choice of the editor but because he is a valued customer, and of influence in business relations. Or the editor is likely to experience a feeling of restraint when it comes to the expression of an opinion that might affect directly or indirectly a financial interest. It should hardly be expected of him that he would play the rôle of a reformer with enthusiasm. But as a rule the house is pretty fair, the editor is honest and not conscious of servitude.

Society Papers.

It is needless perhaps to remind ourselves that most of the matter of our periodicals consists of papers read before associations, and discussions thereupon. The organization of many new societies has increased correspondingly the number of such papers. In Illinois for instance there are now twenty-seven local organizations instead of five or six a few years ago. So there are being written, read and discussed five times as many papers.

Are these all worth publication in our periodicals? Certainly not.

Is it worth while that they should be written and delivered? Certainly it is. It is necessary to the interest and to the very existence of each society that papers be written by its various members. These may not be necessarily of high quality nor literary excellence. An indifferent paper may occasion a valuable discussion, or its tone may promote good will and harmony. It is the *spirit* of the writer that counts most. Moreover it is worth while for the awakening, encouragement and development of the writer himself. He is the better for his own effort. He has made an advance step. By the writing of his first paper, with doubt and timidity perhaps, many a one has discovered himself, and opened up a new career of usefulness and happiness.

But in the worst written paper there is likely to be something of value, a practical suggestion not only for the members of the local society but thousands more if they had it presented.

It seems to me that we ought to have some system for saving these fragments.

It could hardly be expected that the local society should always have among its members a first-class editor. If so fortunate of course his services would be available. But suppose the State Association were to appoint an editor of unquestioned ability, to whom all papers unsolicited by publishers should be submitted;—always typewritten;—suppose he were to go over these one by one through the year, making brief notes or quotations; and suppose that at the annual meeting he should present a summary of what he had discovered; would it not be

worth while? There ought to be some one in the State, who would love to do this work, and in the interests of conservation the profession could even afford to pay him a small sum for his service.

In passing we may say that abbreviation of certain of the papers now published in the whole, would diminish cost of printing and be a refreshment to the reader.

What has been said with reference to the making of books applies to the writing of articles for societies or journals. The editor is often sorely tried, fairly appalled by the prolixity, useless repetition, the careless slinging together of words, in the manuscripts submitted for his use. And he publishes stuff perforce, that he knows in justice to the reader and the author himself should be entirely rewritten.

The Publishers and The Reader.

What encouragement is there for the publisher of dental books? Very little I fancy. I am not very much in the confidence of those gentlemen, but it is my impression that they have grown wary of the risk. I am sure that as a rule such books have not paid. Personally I know of but two, one on operative dentistry, another on orthodontia, that have been fairly remunerative to authors or publishers.

Why? We may as well face the answer squarely unflattering though it may be. Dentists as a rule *do not read,* and they *will not buy,* books. They are not students of the literature of their own profession nor of the wider literature of general medicine and surgery. As a rule they are not very familiar with any sort of literature beyond the daily newspaper or some dental magazine which contains as they think the greatest number of paragraph articles—that they count "practical." They have no use for any reading which does not seem to have an immediate relation to the dollar they are after. How many, think you, out of a hundred have ever read studiously one standard medical book?

I have not, I think, the disposition of a pessimist or a "knocker." On the whole we may be making progress, but I am not disposed to any Fourth of July celebration in these conventions—with fire-crackers and rockets or spread-eagle oratory about our "glorious history" and wonderful advance.

I know of one book that ought to be in the library of every dentist, for reading and reference; an authoritative book. It fulfils the conditions of a good book in matter and literary style. I imagine no publisher was willing to undertake, for it was privately printed at the author's expense. I presented this book to the attention of fifty students, so-called. They admired it and admitted its value, but not one

would invest therein two dollars. Neither would the practicing dentist one in a thousand probably, if it were put under his nose.

Dr. Arthur D. Black, a few months ago read a paper before the American Institute of Dental Teachers at Ann Arbor, entitled *"Suggestions for Making the Dental Student a Better Student Dentist."*

It was printed in June number of the *Dental Review*—(How many present heard or have read the article?) It is worth while perhaps to quote a few sentences from this remarkable paper:

"We must realize that the dentist graduated without having been taught to study will not be equipped to keep pace with the progress of events."

"We must develop a new type of dentist." "He must be essentially and especially a man who *thinks.*"

His criticism of our present system of dental education is that students listen for hours to talk, talk, talk; with more or less of occular demonstration, but they are not taught to read, to study, to reflect, to master problems by their own mental processes. They read only to cram for an examination. Dr. Black proposes the substitution in large measure of a recitation system, wherein the student shall acquire information far more than he does now by books. And the most important thing about this is that he forms a habit for his whole professional life.

He says, "If a man is trained during three or four years to get his knowledge from books, to spend his evenings with them, to have them for his constant companions instead of having all his information poured in from a rostrum, or crammed in under examination pressure, he will have learned to depend on books, and will be more likely to use them in the future."

I will add to this statement of Dr. Black what naturally follows; that if the student practitioner reads books, he will have a desire to own them, he will buy a few, the publisher could count on publication without loss; and the writer of a really valuable book would secure a royalty that would pay possibly half what a plumber gets per hour for his time.

Whatever the outcome may be of Dr. Black's plan, any reader of his paper will have stimulus of thought.

A man's vocation should lead in his reading as it does in his life. Why should not medico-dental literature, book or periodical, have first claim, over and beyond the daily newspaper, the story magazine or the always ejhemeral "best seller"? ("Have you read *Trilby?*")

What relative interest have you or I as to who the devil won the impossible female that a mercantile writer created and named *"Barbara West"?*

We shall never be gloriously free until, when we are asked by Tom, Dick or Harriet, "Have you read?"—this or that book of fiction, we are able to respond with exultation, *"No!* thank the Lord, I have not."

To read literature of importance with benefit, surely one must be able to think as he reads. This involves aloneness, quiet, *time.* To obtain this seems to be increasingly difficult for most of us. We are living in the age of greatest distraction. Recent discoveries have multiplied complications that get their grip on everybody.

A wise friend said to me not long since: "Talk about the simple life; there isn't any such thing. One is called on every minute to do something, answer somebody, and to decide questions immediately that will not wait. The decision may be wrong, but no matter, he must make it."

My friend was not far from the truth. He has since yielded up his own life to what he called his *"besetments."*

Within one or two decades the world seems to have gone *power mad* and *speed crazy.* Nations, like men, and with men, have grasped these new forces of science, and applied them not to conservation but destruction. They are being made the instruments of hate and wholesale murder on a scale never dreamed of hitherto.

What we call efficiency, and worship as such, has been organized to make hell on earth. It has made whole nations apparently insane, without judgment or right feeling. The civilized world, so-called, is dazzled with new science till the sun of righteousness is well-nigh eclipsed.

What chance has real literature that requires the spirit of repose, reflection? What has become of the fireside, the quiet home circle, the reader and the listener?

From the time our children enter the grammar school at six till they leave high school at eighteen they are crowded with ever-increasing multiplicities. Essential unities are likely to be lost out of sight. So-called students have no time for going deep into anything. Outside of school they demand but amusement, excitement, thrills.

Why should they *read* natural history, when they can see the "real thing" in the "movies?" Who among them knows the meaning of "the classic"? A high school student will ask if Æsop is living, or a Dutchman? (The handsomest, best-groomed young dentist I ever knew, said that he had often heard of Dickens, and he meant some day to read the book.)

What use of an old road? Take a short cut through the brush. Why read a standard book with stillness, when one has the "Compend," all in short paragraphs; or the quiz-class with lively company? Do

nothing alone. Why read history or political economy. Go with ten thousand others and listen to Bryan. He will tell you all that is worth knowing in an hour.

What use have we for the old past anyway? This is a *new* age with law unto itself. Everything has changed—except the universe—and human nature.

An Office Building for Dentists.

By C. W. Dickey, Architect.

It is with great pleasure that I have accepted your invitation to present this paper on the subject of "And Office Building for Dentists." As an architect, I appreciate the need for better co-operation between your profession and mine in order to better serve your needs and thereby better serve the interests of our clients.

It is my business to design buildings that will pay dividends. Such buildings must be kept full, which means that the occupants must be kept satisfied.

Dentists Unpopular as Tenants.

Dentists as a class are the most expensive tenants we have to provide for, but I shall attempt to prove that they can be made profitable to the owner. They form a very large percentage of the office building tenants in any city, particularly in the smaller cities, and cannot be overlooked. Both dentists and physicians are unpopular with owners in general. The reasons for this lack of popularity were well expressed by William F. Bensing in the September, 1914, number of *Building Management,* as follows:

"(1) That the initial expense of equipping offices for this class of tenants is larger than for the average commercial tenant.

"(2) That in buildings where electricity is furnished gratis, the cost of supplying physicians and dentists with this commodity is very much increased on account of electrical equipment in their offices.

"(3) That this class of tenants is very hard to please; that they are very temperamental and do not have any idea of business.

"(4) That the cost of janitor service is increased about one-third by the occupancy of dentists and physicians.

"(5) That elevator traffic is considerably heavier by reason of their tenancy in a building.

"(6) That unless a building is strictly specialized for dentists and physicians, the fact that they occupy space in the structure is detrimental to renting the balance of the space."

In spite of all these more or less real objections, this class of tenants must be accommodated, and the object of this paper is to discuss how best this can be done to the satisfaction of both owner and tenant.

Office Rents.

Office space is generally rented at a certain price per square foot. Often a dentist has to pay for much space that he does not require because the plan of the building does not readily lend itself to subdivision for his needs. This is a disadvantage, both to the tenant and the owner; the former has too much space to carpet and furnish; the latter has too much space to heat and light and keep clean. A properly and compactly planned office with ample room, but no waste space, gives much more the impression of efficiency than an awkward, ill-arranged and overgrown office. In this fact lies the solution of the problem. A properly planned building which lends itself readily to compact dental suites can demand a higher rental per square foot, and yet the lump sum rental to the tenant will be less than in other buildings. The dentist requires certain things and is willing to pay a certain monthly rental to secure what he requires. It makes very little difference what the price is per square foot if he gets what he wants for a certain lump sum. This theory works out in practice. The specialized buildings, catering to dentists and physicians, get a higher rental than their neighbors, and yet are always well filled. This is especially true of such buildings as the Michigan Boulevard Building, the Reliance Building, and the Marshall Field Annex Building, of Chicago; the Cobb Building, of Seattle; and the Elkins Gunst Building, of San Francisco.

Faulty Plans of Office Buildings.

The question now arises as to wherein the ordinary office building fails to meet the requirements of the dental profession. In the first place, the windows are not spaced so as to permit a series of small rooms with windows at or near the center of each; in the second place, the public corridor is ordinarily placed too close to the outside wall to permit of an economical use of the space. These conditions cannot be overcome after the building is erected. The utilities, such as electricity, gas, compressed air, supply and waste for fountain cuspidors, etc., are usually inadequate or badly placed, but this, of course, can be overcome, though at considerable trouble and expense.

Proper Plan for Dental Office Building.

We now come to the crux of the whole matter: what should be the plan and equipment of an ideal building for dentists? Are their wants sufficiently standarized to permit an architect to satisfy all the members of the profession? These are the questions

I have been diligently studying for some months past, with the kind assistance of a number of dentists, dental supply houses and architects. Although opinions differ on many important matters, all seem to agree that the essential requirements for the average dentist consist of a waiting room; two or more operating rooms; a laboratory; a ladies' retiring room; a small storeroom or cabinet; a business office or a suitable space for a desk where the dentist can talk business privately with the patient; a private exit to the public corridor, and a vestibule or hall connecting all these rooms, so that the office girl can see the patients after they are through in the operating rooms or dressing room. Some dentists require considerably more than this, and others require less, but this seems to be a good average. I shall take up these various items in their order.

Waiting Room.

The waiting room need not be large, as most patients come by appointment, and no patient is required to stay long in the waiting room. This room should be well ventilated and well lighted, either by natural light or artificially. For a small office it should better be an inside room, as this permits the most economical arrangement of the office suite. Those demanding natural light for the waiting room will have to secure it at the sacrifice of valuable space. A small room furnished in good taste is more inviting than a large room, and a warm light from attractive electric fixtures of the semi-indirect type is more attractive than natural light on a dark day. If electric lights are turned on in a room having an outside window, the effect is not as inviting as in the room with no outside light. Ventilation can be obtained by the use of transoms and fans.

Operating Rooms.

Operating rooms should open upon a vestibule, should have a window at or near the center of one side and should be large enough to receive the operating chair, cabinet, basin, etc., and leave sufficient room for the operator and his assistant. This requires a room about eight feet wide and nine or ten feet deep. If a laboratory bench is to be placed in the room, it should be ten feet wide or twelve feet deep. The window should be placed so as to leave at least eighteen inches for a switchboard on one side and an engine on the other, and should extend as close as possible to the ceiling. The basin should have pedal or knee supply valves. Many dentists are placing the switchboard back of the cabinet supported on an angle frame and set at an angle of 45 degrees with the wall and are removing all apparatus from in front of the patient by using an operating table which supports the engine, etc., and is placed back of the chair and a little to one side. I shall not attempt to discuss

the merits of this scheme, but as it has not yet been generally adopted, it is still necessary that provision should be made in the building for placing these utilities at the right and left of the window. If desirable for architectural effect, a mullion window or pair of windows may be used in place of a single window. The mullion or pier, if not over two feet wide, will cast no shadow. In case of a pier between the windows, the switchboard can well be located on its face.

It is highly desirable that the patient should be able to enter the chair without interfering with the operator or his instruments. This means that there must be space to get around the chair and cuspidor on the side opposite the cabinet. Allowing eighteen inches for the cabinet, eighteen inches for the operator, thirty-six inches for the chair and fountain cuspidor and twenty-four inches for a passage for the patient, we have a width of eight feet which should be adopted as the minimum width for operating rooms. This means that the windows, allowing for partitions, should be placed eight feet four inches center to center in order to obtain the greatest economy of space for dental offices. This spacing would not be economical for a commercial office building, as it would mean the alternative of sixteen-foot offices, which are too wide, or eight-foot offices, which are too narrow.

Laboratory. The laboratory can be placed between two operating rooms with its own outside window, and as this room need not be more than four or five feet wide the extra space can be thrown into one or both adjoining rooms. Or the laboratory can be placed back of an operating room receiving its light through a glass partition.

Retiring Room. The ladies' retiring room need not be more than five feet by six feet six inches, as the only furniture it need contain is a dressing table, a chair and a couch. This room can be placed at any convenient point opening onto the private hall. A lavatory and toilet are useful adjuncts to this room if there is sufficient space.

Store-Room. A small store-room is useful, but can be dispensed with if a good-sized cabinet is provided with space for coats and hats and a separate space for storage.

Business Office. The business office, whether a part of an operating room, a hall alcove, or an independent room, should be so placed that each patient must pass the desk before leaving the office. It is preferable to have a small separate office for privacy in discussing business with patients.

The general exit can be direct from the private hall or through the business office, but should not be through the retiring room.

In examining the plans of a great many office suites I find that the most economical schemes require from twenty-two feet to twenty-six feet depth from corridor to outer wall. In the Marshall Field Annex, in Chicago, and the Cobb Building, in Seattle, this width is twenty-six feet. I find that a width of twenty-three feet from corridor to street front works out well. If we assume these dimensions and a window spacing of eight feet and four inches center to center, with windows four feet to five feet wide, so as to leave the necessary space for apparatus, our problem is half solved. The column spacing or "bays" can be sixteen feet eight inches, with two windows to a bay, or twenty-five feet with three windows to a bay, these dimensions, of course, being modified to fit the size of the lot. I have prepared a number of plans of various sized office suites in a building with these dimensions, from which it is seen that the space subdivides very advantageously in most cases.

Dentists and Physicians in Same Building.

In the early part of this paper dentists and physicians were mentioned jointly. This was done purposely, as it has been found advisable to have both professions in one building. The dentists need a north or east light, while the physicians can use a south or west exposure. This is an important point, as most buildings have offices with both north and south exposures. In some cases it is found advantageous for a dentist and a physician to share one reception room. It is also a good thing to have both professions in the building, as the patients of the one often need the services of the other.

General Building Plan.

Having arrived at the proper width of bays and depths of offices, it is a simple matter for the experienced architect to plan the building with adequate elevator service, stairways, corridors, etc. Two public toilet rooms, one for each sex, should be placed on every floor. The utilities, such as electricity, compressed air, gas, water and waste pipes, should be brought up next to the columns in the outer walls. The office floor should be of wood laid on sleepers imbedded in concrete. This permits each tenant to use the kind of floor he prefers, be it hardwood, carpet or tile. In case the latter floor is decided upon, the wood floor and sleepers are removed and tile substituted. The space occupied by the sleepers and the concrete sleeper-fill can be used for running plumbing pipes and electric conduits to fixtures located where each tenant may elect. Having thus planned and equipped the office space, it should be left without partitions until rented so as to be subdivided to suit the

tenants. The work done this way costs more, but it pays in satisfied tenants.

The woodwork should be plain and sanitary with no mouldings to catch dust, and should be given a hard, sanitary finish. In operating rooms, the space for about eighteen inches on each side of the window should be of plain wood backed up with plank to receive switchboard, engine, etc. Ventilators should be placed in the bottom of these windows so that the lower sash can be raised without causing a draught on the patient. All plastering should have a smooth finish.

The corridors should be wide and of sanitary appearance, with floor and wall of marble, tile, or white glass. These corridors should be given a warm, genial light by a system of indirect lighting. This avoids glass in the walls, which spoils the appearance of the reception rooms and gives too commercial an aspect to the building

Elevators. The elevators should be ample in number and size, and one, at least, should be large enough to receive a stretcher and attendants. The speed should not exceed 350 feet per minute, as a large proportion of the passengers will be women and children. The elevator car should be given somewhat of a domestic character by the use of hardwood panelling, finished natural or enameled, with a judicious use of gold. Here, too, a warm, cheerful light should be obtained by indirect lighting from a painted or gilded ceiling.

Entrance. The entrance lobby should be treated a little differently from the lobby of an ordinary office building so as not to look too commercial. A judicious use of ornamental trees in boxes would be effective.

The tenants of the basement, first and second floors should as far as possible be of those professions or businesses that respond to the needs of dentists, physicians and surgeons, such as pharmacies, dental and medical supply stations, hypdrotherapeutic baths, dental and medical laboratories, X-ray establishments, etc.

I shall not attempt to discuss the best varieties of wood for finishing the various rooms, nor the kind of electric lighting fixtures, etc. These matters, like the furnishings, are subject to the personal taste and caprice of each dentist, but I would venture to suggest that most dentists would do well to leave these matters to the judgment of an experienced architect. The office should be built with a definite plan from the layout of the rooms to the smallest detail of hanging a picture. Only in this way can perfect harmony, which impresses the class of people whom the dentist desires for patients, be obtained. The effect sought should be one of

simple refinement; the office should look business-like, but not to commercial; and the operating rooms, although sanitary in appearance, should hold no suggestion of a hospital. A properly planned, decorated, lighted and furnished suite of rooms will help to put the patient in a calm state of mind and will greatly aid the efficiency of the dentist.

In conclusion, let me say that the experience of managers of specialized buildings of the kind discussed in this paper has proved that they are most satisfactory. The specialized building facilitates renting after headway has been gained, gives a greater ability to retain tenants, promotes good relations between one tenant and another, as their interests are largely in common, and offers inducements for tenants to enter into leases and to renew leases. With these advantages before them, and with the success of other owners for encouragement, it should not be hard to induce owners to erect specialized buildings for dentists and physicians wherever there is a real demand for such buildings.

Reports of
Clinics Presented Before the Congress

Report on Clinics.

We have adhered to the rule repeatedly published, that no mention would be made in these transactions of any clinic not reported or briefly described by the clinician. In addition to published notices, letters were sent asking for these descriptions, giving clinicians two months to write the same, and in many cases no reply was received.

An endeavor has been made to publish the descriptions of the clinics as received from the clinicians, but in many cases certain changes have been necessary in order to adhere to the rules of the Congress in regards to trade names, etc.

The clinics were given on the fourth floor, West side, of the Civic Auditorium, the entire floor being given over to the clinics.

It was intended that a progressive clinic should be given in four rooms, but owing to the fact that the clinicians would not report on time (some never reporting), and also that members viewing the clinics would not follow instructions, although every means were taken to make them simple, this plan was abandoned, making a general clinic of them all.

The Clinic Committee provided new chair units with electric engines, bracket lamps, fountain cuspidors, electric sterilizers, compressed air, emergency hospital, X-Ray laboratory and an expert radiographer on hand to take a radiograph of any clinical case, and a superabundance of clinical materials, and last but not least, plenty of light for all clinics, by large skylights. A student assistant, operating gowns, basins for washing and sterilizing hands were also furnished.

All clinicians expressed themselves as highly pleased with the accomodations, which was a source of pleasure to the Clinic Committee, as we had worked indefatigably to accomplish this end.

It might be well also to state that this Committee had nothing to do with the selection of clinicians, that being in the hands of the different State executive committees, who sent in the names of the clinicians to the Chairmen of the different sections, who in turn forwarded them to this Committee. We merely "staged the show," and we did this to the best of our ability.

Clinic Committee,

JOHN D. MILLIKIN, *Chairman.*

G. V. Black Club, University of California.
Dr. Fred E. Hart, Director.

The clinic as a whole is intended to convey to those who witnessed it, the purposes of the organization by presenting that part of Dr. G. V. Black's work which stands out pre-eminently in the minds of the profession as his foremost work, and in addition thereto to supplement it by clinics in prophylaxis, root canal work, pathology, histology, chemistry and metallurgy, showing the great diversity of his interests in dental science.

As a teacher Dr. Black was without doubt one of our greatest leaders. His sincerity of purpose, his pursuit of truth, was an inspiration to many men who are working out some of the difficult problems in dentistry to-day, and that inspiration which brought about the formation of the Club, makes it possible to enjoy the privileges and resources for teaching and investigation which its affiliation with the University of California offers, and which as the Club matures, it is hoped will be of value to the profession of the Pacific Coast.

The Department of Chemistry and Metallurgy with its research laboratory offers facilities for investigation of problems which to-day are commanding the greatest attention of the profession.

The Department of Prosthetic Dentistry offers many opportunities for an investigation in the problems of occlusion, casting, etc., many of which are closely associated with operative procedure, and the exhaustive experimental work in the treatment and filling of root canals by the representative of that department shows, not alone the necessity for careful work in this field but the intimate relationship between operative and prosthetic procedures in dental practice.

The value of resources for a study of the histological, pathological and bacteriological problems, as presented by one who at present is giving full time service in teaching, with an inclination toward further study and investigation along these lines, is but another evidence of the need for a broader view of operative procedure, one of the objects of the Club.

While not participating as a clinician, the work of the Director of Clinics is manifested in a unanimity of purpose by the personnel of its members in the careful study of the lesions of the teeth and the technical procedures in restoring these organs to usefulness in every sense of the word. This is borne out by the presentation of numerous operations in mouths of the patients exhibited, all of which were made by Club members on regular meeting days under his direction. In addition thereto, the suggestions offered in other fields of operative endeavor, as in prophylactic work under the rubber dam, using a special type of instrument

holder and sterilizer while operating, have added materially to the progress of the Club, and the dissemination of knowledge in operative procedure. As important as clinical experience is in all fields of work in organizations of this character, no greater essential is to be found than proper direction in policy and procedure.

Dr. R. H. Irons, Table Clinic, Indirect Method of Making Gold Inlay.

Showing procedure of taking impression of cavity, making amalgam model, mounting on articulator, etc., and the advantage of method in obtaining accurate fit, contour and occlusion in large restorations.

Cavity displayed M. O. D. in molar porcelain tooth, representing form as advocated by Dr. G. V. Black. Special attention was given to the possibilities the method affords for carving the grooves in the occlusal surface, restoring marginal ridges and properly formed proximal contact.

Dr. S. A. White, Table Clinic.

Showing the use of separators and matrices as advocated by Dr. Black in making amalgam fillings. Models of cavities in porcelain teeth mounted in hard base with soft rubber to represent gum tissue, reproducing the interproximal gum contour showing its relation to the cavity when the latter extended to the positions advised by Dr. Black for the prevention of future attacks of caries.

The demonstration included: First, a copper band held in position by ligatures and, second; the same material adapted and held to the tooth in proper position with a Perry separator. The clinic also demonstrated the use of a full set of Perry separators and the use of the Perry geneal separator as the most efficient method of obtaining quick separation of teeth.

Dr. H. L. Sams and Dr. T. C. Muegge.

Demonstration of plaster models, instruments and charts intended to illustrate the Dr. G. V. Black system in the preparation of cavities and making of fillings. The display was arranged to show the various parts of the system: Dental Anatomy, nomenclature of tooth surfaces and angles: The classification of cavities as they occur: Nomenclature of internal parts of cavities: Classes of cavities as prepared for fillings: Instruments nomenclature showing Black's University set of cutting instruments, giving their formula. Charts showing the application of instruments in preparing cavities. Models showing the progressive steps in making foil fillings and completed fillings, inlays, etc.

A large cast of each arch was exhibited which permitted an interchange of plaster tooth models showing the relation of the gums, the demands for cavity extension, proper form and position of contact, etc., etc.

There were one hundred models in this exhibit.

Dr. J. F. Steffan with Dr. H. O. Eggert assisting. Chair Clinic.

Non-cohesive and cohesive gold foil operation in combination. Patient presenting with cavity in occlusal surface of left lower first molar. Cavity prepared as advocated by Dr. G. V. Black, and filled by placing cylinders of non-cohesive gold on end around walls, keeping them in position with cohesive foil in central portion of cavity, condensing mass and finishing.

Dr. C. B. Musante with Dr. L. J. Jacobsen assisting. Chair Clinic.

Combination non-cohesive and cohesive foil filling.

Patient presented with cavity in mesial surface of left upper second bicuspid. Cavity preparation as advocated by Dr. Black.

Filling made by introducing three cylinders of No. 4 non-cohesive foil, in all, 4 grains, in proximal portion of cavity—which when condensed to place filled the gingival third of cavity. The remainder of the filling was made of cohesive foil, shaped and finished to conform to Dr. Black's teachings in fillings of this class.

Dr. H. J. Bruhns with Dr. C. R. Giles assisting. Chair Clinic.

Patient presenting with cavity in mesial surface of right upper second bicuspid. Cavity prepared for the introduction of foil filling following in detail system in instrumentation and procedure as devised by Dr. Black in the preparation of cavities.

Dr. Wm. H. Hanford. Chair Clinic. Prophylaxis.

Using the Dr. G. V. Black set of scalers, carrying out the principles advocated by Dr. Black in his pathology just published.

As an added feature the rubber dam was applied to the ten lower anterior teeth, to show the possibilities in scaling and polishing with it in position. The teeth must not be ligated but the edges of the holes should be tucked under the free margin of the gum, which will permit scaler to pass to bottom of pocket and at the same time exclude moisture. With the tooth dry, calculus can be plainly seen and polishing done with less injury to soft tissue.

Dr. W. C. Wright. Chair Clinic.

Prophylaxis, demonstrating the use of Dr. Black's set of scalers, showing their position and manner of use. Much consideration was given

to his teachings on this subject in his last work, *Special Dental Pathology,* published but a few months before his death.

An instrument holder devised by Dr. F. E. Hart to hold the Black set of scalers while in use was also displayed.

Polishing was done with orange wood points, rubber cups and floss silk, using pumice and tin oxide as grits.

The interest of the observers was centered upon the instruments and their application largely, as well as the container for the same, which excited considerable curiosity.

Dr. Thornton Craig. Chair Clinic.

Gold inlay, direct method, showing the cavity preparation advocated by Dr. Black as the advisable form of cavity for the inlay. Patient presented with cavity prepared for reception of inlay cast of 22 K. gold. Another feature of clinic was the making of a small depression on the inlay in the exact location the contact point should occupy. Into this was placed a small ball of solder which when carefully fused made a well-formed hard contact in the position desired. Several completed operations of this character of work were also displayed in the same mouth as a part of the clinic.

Dr. E. H. Mank.

A clinic illustrative of Dr. G. V. Black's method of filling pulp canals as advocated in his book on *Operative Dentistry.*

Gutta percha cones are cut into sections about three to four mm. in length, the point being discarded.

Three sizes of canal pluggers are used. These are filed from sterling silver wire 1¼ in. long, 16 gauge and mounted in No. 5 S. S. W. broach holder with soft solder.

A plugger is selected of suitable size for the prepared canal, passed into it to determine its direction and to assume the same bend as the canal, if any. The plugger is then heated and touched to the larger end of the smallest gutta percha section, causing it to adhere.

The section is carried to place and packed with some pressure, the stiffness of the plugger forcing it effectively into position without any chance for the point to buckle or bend. The process is repeated with the remaining sections in the order of their size, using larger sized pluggers as the pulp chamber is approached. The clinician suggests the use of a lubricant, preferably a paste, combining antiseptic qualities, preliminary to the insertion of the sections.

The use of broach reamers designed to be operated between thumb and finger is also advocated and specimens of teeth showing effects of

their use in curved and angular canals were exhibited, together with the canal pluggers mentioned.

Dr. Guy S. Millberry.

The demonstration includes the ordinary method of volumetric analysis, showing the procedure of determining the total acidity by neutralizing with sodium hydrate. One-tenth of a c.c. of sample was taken, which was diluted with 3 c.c. of Co_2 free, distilled water, and one drop of Congo red added. This was neutralized with n/10 solution of NaOH.

Three samples were taken of each cement liquid, and the average determined. The experiment is not accurate because there is some variation in the specific gravity of the cement liquids, and in order to accurately determine the total acidity of these liquids it would be necessary to weigh out a given quantity, dilute with, say, one liter of water, and take from that an aloquot part, viz., 100 c.c. This would then be neutralized by normal solution of sodium hydrate making a series of five or ten experiments with each acid. Such an experiment, however, would be impossible to carry out in this clinic under the operating conditions.

Dr. F. U. Simonton.

Seventeen specimens were exhibited under the microscope embracing the subjects of pathology, histology and bacteriology as follows:

- Pathology
  - Adamantoma
  - Carcinoma of lip
  - Chronic inflammation of lip
  - Papilloma of lip
- Histology
  - Development of teeth
- Bacteriology
  - Streptococci
  - Staphlococci
  - Pneumococci
  - Leptothrix

Gold Foil Operations.

Table Clinic by
The California Study Club.

Members { W. R. Hughes.
M. J. Congdon.
C. F. Jarvis.
R. B. Griffen.
R. W. Rule.

Specimens of natural human teeth were shown mounted in pairs. In one tooth of each pair, cavity preparation was exemplified, showing position of cavity outline, bevel of wall, method of anchorage, etc. In the other tooth a complete gold operation was shown, such as would be placed in a cavity as demonstrated in the companion tooth.

This exhibit showed practically all classes of cavities prepared for the reception of the filling material, and accompanying each tooth which demonstrated a certain class of cavity, was a companion tooth, showing a completed gold operation placed in a similar cavity.

This exhibit also contained teeth demonstrating various steps in the introduction of the combination cohesive and non-cohesive malleted gold foil filling. One tooth showed a prepared cavity involving the mesial and occlusal surfaces of a molar tooth. The next tooth showed the manner of placing the non-cohesive gold cylinders in the gingival portion of the cavity. One cylinder was placed against the buccal wall of the tooth, a second against the lingual wall and a third was placed between them. All cylinders are placed with one end against the axial wall of the tooth and the other end protruding a short distance out of the cavity. Cylinders are selected that are of a sufficient length to protrude slightly from the cavity.

The next tooth showed a similar cavity in which the cylinders had been placed and then condensed, with mallet and condenser.

A fourth tooth showed the manner of introduction of the cohesive gold pellets over the pulpal wall and the condensed non-cohesive gold cylinders, thus locking the non-cohesive portion in the cavity.

The operation from this stage on is completed with cohesive gold foil.

All operations shown were made with No. 4 gold foil malleted into the cavity, the mallet being wielded by an assistant, the operator employing considerable hand pressure in conjunction with the mallet.

Preparation of Foil. Preparation of gold was shown, No. 4 soft gold being used and made into cylinders and pellets.

For cylinders the sheet of gold was cut into halves, quarters and eighths.

One of these pieces of gold is taken and folded into a ribbon of the width that it is desired to have the cylinder. This is then rolled on a jeweler's swiss broach, slipped off, the ends slightly flattened with a pliers and is then ready for use.

For pellets the sheet of gold is generally divided into eighths, sixteenths, thirty-seconds, and sixty-fourths, although some prefer to have sixths, twelfths, twenty-fourths and forty-eighths. In forming pellets from these, the corners are turned in and the gold is then taken in the fingers and rolled into pellets, some loosely and some of moderate tightness.

This gold should be kept in a box where it is exposed to the fumes of NH_4HO. When not annealed it is non-cohesive, but when held just above the flame until it is a cherry red it develops marked cohesive properties.

Instruments used in making these operations were also shown.

The cutting instruments were what is generally known as the Black instruments, some being modifications as suggested by Dr. Wedelstaedt and Searle.

Combination Cohesive and Non-Cohesive Gold Foil Operation Using Black's Method of Cavity Preparation.

By Dr. Franklin H. Locke, Oakland, Cal.

Operation in mesio-disto-occlusal surfaces of upper first bicuspid.

Wash mouth and teeth, pass ligature between teeth to assure no sharp edges, then apply rubber dam.

Prepare cavity box shape—occlusal step for retention. Occlusal step should have pulpal wall at right angles with axial wall. Buccal wall and lingual wall should be parallel and at right angles with the pulpal wall. The axial wall is perpendicular to the gingival wall. The buccal and lingual walls are cut back to have margins in areas of comparative immunity. The gingival wall so situated as to have margins slightly below the free healthy gum tissue when filling is completed. All margins are slightly beveled to give cavo-surface angle. Slight convenience or retentive form is made at the gingival-axio-buccal and gingival-axio-lingual point angles of the cavity to assist in holding the non-cohesive cylinders in place during and after condensation. Three cylinders of non-cohesive foil are placed in the cavity, one buccally, one lingually and one wedged between these;

all extending to the gingival wall and extending about one-fifth their length over margins, and placed with end toward the axial wall. These cylinders are now carried down evenly and thoroughly condensed into angles and against axial wall. The non-cohesive foil should fill the cavity to, or nearly to the step. The cohesive pellets of gold foil are next started upon the non-cohesive gold and the whole mass thoroughly condensed.

After gold is all placed the ends of the cylinders are finally condensed back against the buccal, lingual, and gingival margins with condensers and Searle swager. Complete operation with knives, Black's saw, files, strips, disks, etc.

Never use a disk on the contact point. Use Perry's separator to gain separation if necessary and after finishing to point of contact use fine, broad cuttlefish or enamel strips to smooth and polish the contact, care being taken not to flatten the contact point.

The gold cylinders and pellets used are hard rolled from No. 4 soft foil. The cylinders used are non-cohesive. The pellets are passed into a flame and heated until thoroughly red, making same cohesive.

Gold Foil Operation Using Novocain Anesthesia for Cavity Preparation.
Dr. W. T. Ferrier, Burlington, Wash.

The operation was made in the mesial-occlusal surface of an upper left second bicuspid. Incipient decay had attacked the mesial surface.

The deposits were removed from the teeth, upon which the rubber dam was to be placed, with a scaling instrument and the soft tissues cleansed with normal salt solution in a large bulb syringe. The rubber dam was adjusted from the left central incisor to and including the first molar upon which a clamp was placed. No ligatures were used except upon the tooth to be operated on, moisture being excluded by turning the rubber under the gingiva. The teeth were cleansed with alcohol and dried.

The cavity was opened with a small, round bur, starting in the mesial pit, directing the bur mesially and gingivally until the cavity of decay was reached. The outline form of the step was established by the use of the two medium sized Wedelstaedt chisels—straight and contra-bevel and a No. 33½ inverted cone bur.

A No. 558 cross-cut fissure bur was now placed within the proximal portion of the cavity and directed gingivally, bucally and lingually; the same chisels were used to extend the margins to immune areas. The interior of the cavity was now given the proper form to resist the stress

of mastication—to retain the gold—and make it convenient to place, the chisels and small inverted cone bur being used for this purpose.

The cavo-surface angles were beveled with the chisels, except at the gingival wall where Black's trimmers were used. There being no decay left the débris from the cavity was removed with a pellet of cotton.

Within the bucco-gingival and linguo-gingival angles were placed two cylinders of non-cohesive gold, consisting of one-fourth sheet No. 4 foil each; a cylinder consisting of one-half sheet was now placed between the two smaller pieces and malleted against the gingival wall with a large, round bin-angle plugger, directing the line of force toward the gingivo-axio angle. A pellet of cohesive gold, consisting of 1/16th sheet of No. 4 foil was now started in the disto-bucco-pulpal angle and malleted to place using a No. 1 Wedelstaedt plugger. From this point the gold was carried over the entire pulpal wall and on the non-cohesive gold in the proximal portion of the cavity. The gold was all placed using the small plugger and 1/16th pellets above referred to. The mallet force was applied by the use of the mallet in the hands of an assistant.

Searle's swager was driven between the teeth and large gold condensers used to drive the non-cohesive gold within the cavity. Black's saw was introduced in the interproximal space and the surplus gold removed up to the contact point. The surplus filling material was removed from the step by means of finishing burs and stones.

A Perry separator was applied and the teeth separated sufficiently to permit finishing the contact point and to reproduce the normal proximal surface of the tooth. This was accomplished by the use of Wedelstaedt's finishing knives and files and finishing strips of various grits.

The final finish was given with pumice and chalk on moose hide disks and brush wheels. The rubber dam was removed and the parts thoroughly cleansed with normal salt solution.

Use of Black's Parallelogram Condenser.
By Dr. M. Thayer Rhodes, Berkeley, California.

The object of my clinic was to demonstrate the use of non-cohesive gold foil instruments—6 x 12 and 12 x 6 Black's parallelograms—the making and method of insertion of gold cylinders and pellets in a cavity prepared in a celluloid form, and the use of Black's and Wedelstaedt's gold knives and files.

The parallelogram instruments were used to place cylinders in the gingival portion of a Class II cavity in a molar. The cylinders which were used were made of quarter sheets of No. 4 soft gold foil folded

over until the width of the resulting strip was a little greater than the depth of the cavity at the gingival from the axial wall to the gingivo-cavo-surface angle. This strip was then rolled on a fine Swiss broach making a small cylinder, which when placed would have its long axis at right angles to the long axis of the tooth. Three or more such cylinders, depending upon the breadth of the cavity at that point, were placed side by side and condensed with a large parallelogram condenser, using of course, such lines of force as would tend to drive the gold into the cavity rather than to tip it out over the gingival edge. Smaller instruments, No. 6 and No. 7 (Wedelstaedt's condensers), were then used to condense this surface. After this layer was thoroughly condensed, small pieces—pellets made of eighths and sixteenths of a sheet of No. 4 soft gold—were annealed, placed on this surface, and condensed with the last-named smaller instruments.

When the cavity was completed, due attention being paid to the stepping of gold and proper lines of force, push and pull cut files were used to drag the gold over the edges of the cavity and knives were used to trim the excess and the loose ends of the cylinders which projected from the cavity at the gingival and which had previously been driven into the cavity with a swager.

Cavity Preparation and Combination Cohesive and Non-Cohesive Gold Foil Operation.
By Dr. M. Thayer Rhodes.

This clinic was similar to that previously described, in which the same course of procedure was followed.

The cavity was in an upper right second bicuspid, mesial-occlusal surface. The mesial margins were made parallel and formed right angles with the gingival margin. These margins were placed in areas of immunity, that is, where the friction of food during mastication would keep them clean. On the occlusal surface the margins were made parallel and all inside line angles square, except the axio-pulpal line angle which was rounded. Convenience points were placed only at the bucco-gingivo-axial line angle and linguo-gingivo-axial line angle. The walls being freshly cut, the cavity was then ready for the gold. Four quarter-sheet cylinders, of one grain each of non-cohesive gold were placed on the gingival floor with the ends projecting out of the cavity into the interdental space. These were then packed down with hand pressure and mallet force, first with broad, flat instruments, and then with smaller ones. The first instruments used were Black's parallelograms 6 x 12 and 12 x 6 and then Wedelstaedt's No. 6 and No. 7.

Mallet and Hand Pressure Combined.

The gold was placed by the assistant after annealing it on an iridio-platinum broach in an alcohol flame. The assistant used the mallet and the operator used considerable hand force to compress the peridental membrane so there would be less bounce and greater condensation of gold from the blow struck by the assistant. The same blow struck on a non-compressed peridental membrane would not give the same degree of density to the gold that a similar blow struck on the tooth with the peridental membrane compressed by hand pressure would give.

Direction of Force and Correct Stepping.

Correct lines of force must be used and proper stepping so as to make the gold flow from the center of the cavity up against the surrounding walls, there helping to retain the whole mass of gold by its wedging effect against the elastic dentin walls of the cavity. Incorrect stepping, that is from the walls into the center cause the gold and tooth to have a microscopic margin between, which in the course of but a few months, by allowing the saliva to enter will cause the cavity to leak and the tooth or at least the portion next to the margins to become darkened. By a little excess of malleting at the contact point the tooth operated upon and its approximating neighbor are caused to move apart, thus giving proper contour to the restoration and eliminating the use of the separator at this point for that purpose. A swager was then used to condense the ends of the cylinders into the cavity, more if possible.

Finishing.

The gold in the interdental space was then trimmed to form by use of the Kaeber saw, Black files, and Wedelstaedt knives, until there was no excess over the margins and the form of the tooth was carefully restored. By means of the separator the contact point was next restored to form making it possibly a little narrower than normal so that it would form as Black describes, a contact point similar to two marbles. A broad contact means a larger area of possible decay in the adjoining tooth, for a tooth is likely to decay in proportion to the size of the contact point and is not protected by having food severed as the small contact points are more likely to do. This whole surface was finished down even with the margins with strips and discs, great care being taken not to reduce and lose the contact point or to alter its shape from that described above.

The occlusal surface was finished to the margins of the cavity, restoring the ridges and grooves to the dimensions of the normal tooth,

and polished with suitable instruments that would fit into the grooves and not destroy the contour. Burs, small stones, strips on a split mandrel and broken discs on a screw mandrel, small brush wheel and straight stiff brush on a straight hard-piece, together with fine pumice followed by silex, or whiting gave the desired finish.

Gold Foil Filling in Bicuspid.
By Dr. H. K. Stebbins, Tacoma, Wash.

Operation. A gold foil operation in the mesial-occlusal surface of an upper right second bicuspid.

Preliminaries. Soft tissues and crowns of the teeth prepared for the reception of the rubber dam; occlusion of the teeth studied; rubber dam was then adjusted from the upper right second molar to the upper left central incisor.

Outline Form. The lingual and buccal margins of the cavity were cut with a chisel to areas of comparative immunity.

Retentive Form. Retention for the metal was secured in the occlusal surface including the distal pit. The gingival wall was cut flat, the lingual and buccal walls were parallel and met the axial walls at right angles. No retentive pits were cut in the gingivo-axial angles. The cavo-surface angle was cut and then the cavity was cleansed. The cavity was then examined by the men who were interested.

Placing the Foil. Two quarter-sheet cylinders of No. 4 non-cohesive gold foil were placed, one in the linguo-gingivo-axial angle, and the other in the bucco- gingivo-axial angle, and each partially condensed. Between these one quarter-sheet cylinder was placed and partially condensed. The condensing of the cohesive gold foil was now commenced in the anchorage, which was in the occlusal surface, and gradually step by step, more and more cohesive gold was added until it reached the non-cohesive gold, which had been placed in the mesial portion of the cavity. With the addition of the cohesive gold in the mesial portion of the cavity, the non-cohesive gold was gradually condensed to place. The gold was then laminated from the mesial surface to the occlusal surface, until the cavity was more than full. The gold was then malleted at right angles to the cavity proper until all was firmly condensed. A Searle swager was used in the inter-proximal space to spread the gold over the gingival margin.

Trimming to Form. Wedelstaedt trimmers and knives were used to give the gold a proper form.

The polishing was done with fine strips, discs, plug-finishing burs, pumice, and chalk.

Gold Foil Filling in Molar.
By Dr. R. S. Williams of Tacoma, Wash.

Operation. A gold foil operation in the mesial occlusal surface of an upper right first molar.

Preliminaries. Soft tissues and crowns of the teeth were prepared for the reception of the rubber dam; occlusion of the teeth studied, rubber dam was then adjusted from, and including the second molar to the median line. No ligatures were used to secure the dam but it was held in place on the second molar with a No. 16 S. S. W. clamp and a piece of warm modelling compound was placed on the upper right central incisor.

Outline Form. The lingual and buccal margins of the cavity were at once cut with a chisel to areas of comparative immunity.

Retentive Form. Retention for the metal was secured in the occlusal surface including the central pit; the gingival wall was cut flat, the lingual and buccal walls were parallel and met the axial walls at right angles. No retentive pits were cut in the gingivo-axial angles, so reliance was placed for the anchorages of the metal in the dovetail which was cut in the occlusal surface. The cavo-surface angle was cut and then the cavity was cleansed. The cavity was then examined by those who were interested.

Placing the Foil. Two quarter-sheet cylinders of No. 4 non-cohesive gold foil were placed, one in the linguo-gingivo-axial angle and the other in the bucco-gingivo-axial angle and each partially condensed; between these, two half-sheet cylinders were placed and partially condensed. The condensing of the cohesive gold foil was now commenced on the anchorage which was in the occlusal surface and gradually step by step, more and more cohesive gold was added until it reached the non-cohesive gold which had been placed in the mesial portion of the cavity. With the addition of the cohesive gold in the mesial portion of the cavity the non-cohesive gold was gradually condensed to place. The gold was then laminated from the mesial surface to the occlusal surface until the cavity was more than full. The gold was then malleted at right angles to the cavity proper until all was

firmly condensed. A Searle swager was used in the inter-proximal space to spread the gold over the gingival margin.

Trimming to Form. First, the surplus gold lying along the gingival margin was removed by a small Kaeber saw, then hand instruments—Wedelstaedt trimmers and knives—were used to give the gold a proper form.

Polishing of operation was done with fine strips, discs, plug-finishing burs, pumice and chalk.

Thanks are hereby returned to Dr. F. H. Kestler and Dr. W. R. Hughes for able assistance.

Inlay Technique.

The Making of a Perfect Fitting Gold Inlay.
By Dr. J. U. Conzett, Dubuque, Iowa.

There is nothing absolute in this world, so the title must be understood to be relative, but the idea is to make an inlay that will so perfectly fit the cavity that to all intents it is perfect.

The method demonstrated consists of the proper cavity preparation, the proper wax and manipulation thereof and the proper investment, burning out and casting.

In the cavity preparation we follow the lines laid out by Dr. G. V. Black, in so far as they can be followed in the making of an inlay and only deviate to the extent necessary to meet the exigencies of the case.

All of the lines of the preparation of the cavity should flow into the same, that is, there should be no flat seats, aside from the gingival seat and occlusal step, upon which the finished inlay might ride and prevent its perfect seating in the cavity. We do this in order to compensate for shrinkage, which will be explained later.

The cavo-surface angle is generously beveled all around and the bevel is greater than that usually given for a filling, for the reason that we desire to have a sufficient flange cast upon the inlay to burnish to perfect adaptation.

Manipulation of Wax.

The wax used is one that is hard at mouth temperatures, for we do not chill the wax after insertion, because cooling causes the wax to shrink and will to that extent cause a discrepancy in the inlay. All of the different processes of the making of the inlay should be carried out as nearly at the same temperature as possible. Open mouth temperature is only slightly above room temperature and if all of the processes are carried out at room temperature there will be very slight errors due to change of temperature and shrinkage or expansion due to changes thereof.

The wax should be forced into the cavity and pressed into the same from all directions and pressure maintained until the wax is hard, that all of the shrinkage of the wax in cooling may be taken up by other portions of wax being forced in to take the place of the shrinkage.

Price has demonstrated that wax is elastic and so it is, *in an abnormal condition;* when pressed into the cavity, by reason of the stress placed upon its molecules during the insertion of the wax, it will tend to return to its natural condition when the stress is taken away and we will have a distortion of the model by reason of the elasticity of the wax. We therefore release the elasticity of the wax while it is still in the cavity. We do this by reheating the wax. This is done by throwing a continuous stream of warm water upon the wax until it is thoroughly warm and then to be sure that we have entirely released the elasticity we carve the model to form with warm instruments.

The contour of the tooth is carefully reproduced and the interproximal space provided for by the assurance of a perfect contact point.

Compensation for Shrinkage.

The pattern is now removed from the cavity and with a sharp lancet a shaving is taken from the pulpal wall of the wax; this for the purpose of compensating for shrinkage, for no matter how carefully we have carried out all of the other processes, we will still have the shrinkage of the gold to contend with, and no manner of casting will overcome this, for it is inherent in the material itself. We explained that all of the lines of the cavity were made so that they flowed into the cavity; now as we relieve the wax on the under surface where it comes in contact with the occlusal step, we will have a slight discrepancy there that will allow the inlay to seat in the cavity the distance of the shrinkage of the gold, and we will have a perfect adaptation at the gingival margin.

Investment.

The wax is now ready for investment and should be invested in an investment at room temperature. The water should not be hot or cold but lukewarm. The model should be washed off with soap and water or a little alcohol. The burning out should be carefully done, and the flask not overheated; it is only necessary to burn out the wax and not to burn the investment to dissolution.

Then cast gold; the heating to melt the gold will sufficiently heat the flask and investment to compensate for temperature changes.

If all of the processes have been carried out as outlined the inlay when malleted into the cavity will have margins so closely adapted to the walls of the cavity that they will defy detection by the naked eye.

Method of Correcting Defective Inlay.
By Dr. C. Carlyle DeMille, Seattle, Wash.

This very simple method of correcting a defective inlay is accomplished by adding a small quantity of mercury to a few pellets of gold

foil, making a mercury and gold alloy. The inlay is placed in the tooth and this alloy is burnished into the defect; this is then removed intact and heated slowly over an alcohol lamp, or an electric annealer. The mercury is driven off and the gold remains, having formed a new permanent margin to the inlay.

Some Uses for Gold Amalgam.
By Dr. O. L. Frazee, Springfield, Ill.

This clinic suggests the use of the combination of gold and mercury, instead of subjecting a bridge, crown or inlay to the high heat necessary for the fusing of solder to make additions or repairs.

The gold in the form of mat or foil is added to, or saturated with mercury until it is thoroughly plastic; then added to the piece to be repaired which is then heated sufficiently to volatilize the mercury, leaving the gold thoroughly attached to the piece in the form placed.

Porcelain Restoration.
By Dr. Arthur M. Flood, San Francisco, Cal.

This clinic consisted of demonstrating the preparation of a cavity, the burnishing of the platinum matrix with one one-thousandth platinum, and the baking of a porcelain restoration for an upper incisor, using Jenkin's low-fusing body.

The use of the one one-thousandth platinum is preferred for the reason that it can be burnished and reburnished to the cavity; for owing to its sufficient stiffness, the porcelain can be baked in the matrix without warping the same.

A particular form of preparation for an approximal cavity in the anterior teeth was demonstrated, which permits of burnishing the matrix and the withdrawal of the same with a separation of the thickness of a sheet of paper. This is done by preparing the cavity from the lingual surface with the lines diverging from the buccal to the lingual, thus permitting of the withdrawal of the matrix from the lingual surface. In order to do this, however, it is necessary after the matrix has been burnished on the buccal margin to pare the matrix away from this margin by means of a sharp knife, which leaves this margin free. By careful technique in the placing and baking of the porcelain and reburnishing of the matrix to the cavity, this margin can be baked up as close as that of any other portion of the filling.

Jenkins's low fusing body has proved most satisfactory in the hands of the operator, demonstrating that it has ample edge strength, even being

capable of resisting successfully the stress of mastication in approximo-occlusal cavities in bicuspids and molars, where a sufficient bulk of the porcelain can be secured. The operator has also proved to his satisfaction that Jenkin's low-fusing body will preserve its color as well as that of any other body that has come under his notice. Inlays inserted ten and twelve years ago have recently come under the operator's notice and were as perfect in color as on the day inserted, and this does not mean that they were by any means off shade at the time they were inserted.

Incisal Restoration with Porcelain.
By Dr. Frank W. Shores, Oakland, Cal.

The case presented a vital left central incisor demanding restoration of three millimeters of the mesial-incisal, also entire mesial-approximal surface.

Preparation of Cavity. A step is formed four millimeters from the incisal surface for retention; also defined flattened seat at cervical margin for retention, resistance of stress and as an aid to exact seating of filling.

All enamel margins beveled to a knife edge by the use of chisels and stones. No strips or discs ever used in cavity preparation for porcelain.

Labial line prepared in two curves to aid an obliteration of cement line, also to overcome shadow.

Matrix. 1/1000 platinum is used and burnished direct to tooth. Trim platinum to approximate the shape of a vertical cross section of tooth with twice its area to allow for matrix overlapping all margins of the cavity. This is important as it prevents any change of shape from handling, or by contraction of porcelain in fusing.

Brewster's high-fusing porcelain was used. The foundation fusing at 2250° F. makes the bulk of the filling and corresponds to the dentin of the natural tooth. (1st baking.) The colors, usually two in number are placed in position for second baking, fusing at 2150° F., and last an enamel layer of No. XX colorless completes the filling.

A good furnace with pyrometer attachment is necessary in all porcelain work, as our electric currents vary greatly; and timing is not accurate. Constant opening and closing of the furnace delays the work and is injurious to the eyes.

After removing the platinum etch the cavity surface of filling with hydrofluoric acid to remove glaze, protecting all other surfaces with

wax. Five minutes time should be allowed for action of acid. Then wash filling with common soda to neutralize the acid and you are ready to cement.

Cementing. Place dam in position as for gold filling, dry cavity and filling with alcohol and hot air, cement and wedge filling to place with separating rubber or ligature; allow to remain until cement hardens, remove wedge and excess cement and coat with varnish; finish at next sitting.

(Note.) Observe contact of occluding teeth, and if necessary, relieve undue stress to avoid loosening of filling.

A Method of Reinforcing a Porcelain Inlay at the Incisal Margin in Angle Restorations.
By Dr. C. H. Worboys, Seattle, Wash.

This operation consists of preparing the cavity as for an "L" operation in gold foil. The labial and lingual margin is extended over the dentin by removing the enamel, leaving the dentin to protect the pulp and retain the inlay. The incisal cavo-surface angle is beveled as for gold foil. The platinum matrix is then burnished and the porcelain baked in, up to the incisal third. At this time in the procedure *a suitable sized piece of synthetic sapphire* is placed against the platinum at the cavo-surface angle, held with a small amount of wet porcelain, and then fired. The inlay is then completed as usual.

Amalgam.

Weighing, Washing and Mixing Amalgam.
By Dr. James S. Dean, Redlands, Cal.

Truedent alloy is used in this operation. The proportions advertised by manufacturers are nine (9) grains alloy to eleven (11) grains mercury. After weighing, place alloy and mercury in a small bottle and shake for a few seconds. Turn into a mortar and it will be found that the mercury has been taken up by the alloy. Cover the mass with a few drops of four per cent. H_2SO_4 and stir a little. Pour off the acid and mix the mass in the palm of the hand. As the mercury dissolves the alloy, squeeze out the small drops of surplus mercury until the mass will give the creaking sound which indicates the correct mix. Pack the amalgam in cavity and carve as usual.

Dental Electrotherapeutics.

Dental Electrotherapeutics.
By Dr. J. Morse Withycombe, Philadelphia, Pa.

In demonstrating the use of cataphoresis for obtunding sensitive dentin and for the extirpation of pulps, the clinician introduced a method of treating several teeth simultaneously, using for the purpose several fine insulated wires, branching from the main supply wire, somewhat resembling a cat-o'-nine-tails with which to conduct the current to each and every tooth to be treated. He first prepared a strong cocain paste using normal saline solution. Then, taking a piece of gauze composed of very fine wire and cotton (which may be bought at a drapery store) he prepared several pellets and rolled them in the cocain paste, placing one in every cavity and connecting a wire terminal to each, sealed them in with a preparation of gutta-percha and wax, which being a non-conductor, prevented the current from escaping. The current was then agreeably raised during the administration until at length all sensation to the patient of the current disappeared.

Canal Treatment.

Rapid anesthetization was obtained by using an electrode with a big edged surface, such as the wire gauze. In sterilizing canals with zinc electrolysis, the clinician introduced the current by means of a broach on which was wrapped a cotton dressing soaked in five per cent. solution zinc chloride, the application lasting from five to ten minutes using from three to eight milliamperes after which complete sterilization of the periodental area was claimed.

Treatment of Pyorrhea.

In the treatment of pyorrhea alveolaris a new method of applying ionic or Faradic treatment to a large pyorrhetic area was demonstrated. An impression of the diseased area was first taken using an ordinary impression tray and modeling wax. A piece of wire gauze, such as was described in previous treatment, was then placed over the whole impression, and after rewarming the wax, the operator again placed the impression in position, and pressing well home on the gums the gauze was held by adhesion to the wax. Then removing the tray from the mouth

and placing a piece of lint saturated in the medicament over the whole impression, an electrode was ready for treating the gums with ionization, or faradization, or both together.

Dosage. The clinician maintained that the length of treatment can only be determined by experience and idiosyncrasy of each patient, but generally speaking, he gave ionic treatment for ten minutes and Faradic for twenty minutes using zinc chloride for the former and natural saline solution for the latter. The clinician considered it was not generally realized that the advantage of a large electrode was much current, and no pain. Patients soon become fond of the agreeable warmth of the current when so administered and successful treatment was rapid.

The operator stated he had continually used electrical treatment in his practice for many years, and advised beginners to obtain eighteen dry cells and to couple them in series. A milliamperemeter could be added later on, but a rheostat is essential, and a simple one could be constructed thus:

Rheostat. Prepare a piece of tough wood, nine inches long by one-eighth inch diameter, sandpaper to smooth round surface, allow one end of rod to stand in solution of salt, glycerin and water, when not in use. When operating, suspend horizontally and thread two carbons thereon, each one to carry a terminal of broken circuit.

Prophylaxis and Periodontia.

Surgical Treatment of Pyorrhea Under Conductive Anesthesia.

By Dr. C. T. Starr, Reno, Nevada.

Assuring myself that the patient's physical condition is good, I place the part or parts to be operated upon, in a state of conductive anesthesia, and then with instruments especially prepared for this work, proceed to dissect away all gum tissue that hangs flabby around the teeth, using as a line of demarkation its membranous attachment to the tooth or process, being careful to follow the line of attachment and not simply cutting in a straight line. Having removed all loose tissue, take a large sharp rose-head bur and smooth off all roughened edges of process so as to avoid any irritation to the new forming epithelial covering.

I then pack wet bismuth sub-nitrate paste gauze between the teeth, it acting as a deodorant as well as an antiseptic, allowing it to remain twenty-four to thirty-six hours. In some cases it is necessary to repack more than once. When the membranes become normal, I give the teeth a thorough prophylactic treatment. In conjunction with this treatment I use vaccines for general systemic resistance, and emetin to destroy the endamœbæ.

Clinic Demonstrating the Blood-clot Method of Treating Periodontal Diseases (Pyorrhea Alveolaris.)

By Dr. T. Sydney Smith, San Francisco, California.

In order to show that tissues which have been separated from cementum by pyorrheal conditions will form a vital reattachment to the roots of living teeth if proper methods are employed to assist them, I presented Mr. H. as a cured case. This patient was selected because his case had been mentioned in former papers.* It could readily be seen that all of the pyorrheal pockets have been completely obliterated by the re-union of the tissues. Radiographs of his teeth taken during the Congress

*Report for the Sixth International Dental Congress, London, England, 1914. "The Emetin Hydrochlorid Question in the Treatment of Periodontal Diseases." *The Journal of the American Medical Association,* May 8, 1915.

show the development of much new bone. These reunited tissues resist infection quite as much as normal tissues.

I then presented a case to show the unfavorable results which follow wrong methods of treatment. This patient had been seeking a cure for years and had spent over $3,000 for treatment.

He stated that it was less than three months since he had endured forty hours of extremely painful work consisting of grinding the crowns and planing the roots, followed by immediate polishing with tapes and sticks held in the engine hand-piece. The result was that pockets still remained and his teeth were rendered painfully sensitive. I selected the two deepest pockets and operated on them with such accuracy that there was scarcely any hemorrhage, and the patient expressed surprise that he experienced only a pleasant sensation. This necessary surgical accuracy was made possible by using instruments chiefly of the Younger type, held in correctly shaped aluminum handles. The method of treatment described in the paper which I read at this Congress was employed in these wounds. The result was that rapid healing occurred, and before the Congress adjourned both pockets were obliterated by the reattachment of the surrounding tissues to the cementum.

Treatment of Pyorrhea Alveolaris.
By Eben B. Edgers, Seattle, Wash.

This clinic demonstrated the method of treating pyorrhea by surgical means.

First make a thorough examination of the surfaces of the gums and teeth using a disclosing solution, supplementing it by radiographs to ascertain the condition of the alveolar process and surrounding tissue.

Extract teeth that prove too diseased to save; take off all ill-fitting crowns and bridges; smooth down all overhanging margins of fillings and inlays; fill all existing cavities, and remove all calculus. Polish all etched surfaces of enamel reducing all sharp angles to curves. This is done by the use of a small Arkansas stone, followed by the sand paper discs, fine linen strips, Cutter's silk tape with K. Y. lubricant, to which is added the finer flour of emery. Use a see-saw motion around the tooth, being careful not to work too long in one spot, as you will wear a groove at the gingival margin. After the emery use some very fine polishing powder such as equal parts of oxid of tin and precipitated chalk. When you are sure that the entire surface and crown of the tooth is not only absolutely smooth but also highly polished you are ready to begin work on the root.

Plane the root surface of the tooth. Use the plane with an up-and-down motion resting the third finger on the occluding surface of the adjoining tooth as a pen is grasped in writing. This will help to give a delicate touch and will avoid injuring the surrounding tissue, and planing grooves in the root surface. Always finish a tooth at one sitting as it is apt to be very sensitive on the next visit of the patient.

Proceed in a systematic manner beginning with the central incisor and working toward the molars, completing one side at a time. It is more agreeable to the patient to have one side of his jaw in a comfortable condition for mastication during the treatment.

By this system of thoroughly cleaning and polishing, it is possible to cure pyorrhea by treating each tooth only once.

Surgical Treatment of Pyorrhea Alveolaris.
By Dr. J. G. Jones, Portland, Oregon.

Mrs. M., age thirty-three years; health good. Mouth very unclean, very few cavities, gums swollen, exuding considerable quantities of pus, very little recession, pyorrhea pockets extending almost half way to the apices of the roots, on almost all of the teeth; teeth only slightly loosened as yet. Occlusion unbalanced, because of the pulling of the healthy fibers of the peridental membrane, against the pockets about the roots. The anterior teeth were separating and protruding. In a clinic of this character it is impossible to complete an entire case in the short time.

In this clinic, I selected the upper left central, because it was in such a position as to be easily observed. I first removed the deposits of salivary calculus with a Peeso scaler No. 1. I then ground the enamel surface even with fine carborundum stones, removing the small ridges and elevations, following this with Arkansas stones, then with disks, then with Arkansas stone powder on a leather buffer, and finished with whiting and oxide of tin equal parts on a leather buffer. This process finished the enamel surface with a high polish, which would make the tooth easily cleansed in the future.

I carefully planed the surface of the root all around to the full depth of the pockets, the deepest being on the disto-labial aspect, removing a considerable quantity of the serumal calculus, and dead remnants of the peridental membrane. When the sound, healthy portion of the root was reached, it gave out a smooth glassy feeling to the touch. I then polished around the neck of the tooth with pieces of medium sized Kuroris dental tape, about twelve inches long, on which I place Arkansas stone powder, following this with another piece of tape carrying whiting and oxide of

tin. This clinic should not occupy more than forty-five minutes to one hours' time in one's office, but the time consumed in the work, answering questions and explaining, occupied two and one-half hours.

The object of this clinic was to show the technique I use in the surgical treatment of pyorrhea alveolaris. To have shown results of the treatment, at least one side of the mouth should have been treated, and exhibited again about ten days later. In practice, I find that within two days, the pus has stopped flowing, the inflammation has subsided, and the gums have taken on a healthy appearance. In some isolated cases where this is not true, I invariably find some small particle of serumal calculus which I had missed still adhering to the root of the tooth, or an apical abscess. Apical abscess is a frequent complication. The patient is instructed to brush the teeth at least morning and evening, and to tape the teeth once each week. They are also instructed in the manner of using the tooth brush, and in the use of disclosing solution for plaques and débris which is not visible to the unaided eye. I keep them under observation for a few weeks or months, to be sure they perform this work properly.

The Surgical Technique of Pyorrhea Alveolaris and Oral Prophylaxis.
By Dr. Maxwell M. Dixon (Illustrated with Motion Picture Film.)

In showing this picture on the surgical treatment of pyorrhea alveolaris and prophylaxis the intention is to impress the necessity of removing deposits and foreign bodies which accumulate upon the teeth. I do believe in medicinal treatment, but I am only trying to show surgical operation.

In the removal of deposits it is necessary to have suitable instruments. It matters not what instruments are used provided the desired results are obtained. The successful operation depends upon the individual.

The first thing that I do is to remove all the deposits. Then I take a small Arkansas stone No. 3 and grind the crown and the root of the tooth, smoothing the cervical enamel surface. Then I take a large wheel Arkansas stone and grind the enamel smooth using Arkansas stones of different shapes and sizes. I wish to say that when the cervical enamel margin is smooth and free from any roughness it is necessary to smooth or polish it and when the enamel is smooth there can be no benefit in its polishing. I do not believe in doing anything that does not better the condition and in polishing the enamel one should make the enamel smooth so as to free the tooth from foreign deposits and

food accumulation. There are many different methods of polishing the teeth but I will only give the method I have adopted. After I have used the Arkansas stones on all surfaces of the tooth, root and crown, I use an orange wood point, a port polisher, jig polisher and a small fissure bur that has been ground smooth with a little cotton wrapped around it. Using any one of these instruments I take K. Y. lubricant, vaseline, or water with some Lapp emery and polish the root and crown surface.

For finishing and polishing the crown I use moose-hide wheels of different sizes and shapes, the port polisher, the jig polisher and orange wood sticks, dipping the instruments into vaseline, K. Y. lubricant or water, carrying the grit of emery. This is used after the Arkansas stones on the enamel. Then I use the same instruments for the carrying of the Lapp emery over the same surfaces of the teeth and for the final finishing of the surfaces I use tin-oxide and prepared chalk. For polishing the approximal surfaces, for the first polishing I use fine sand paper disks and strips, then going over the same surface I use fine cuttle fish disks and strips differing in sizes and width in accordance with the retraction of the tissue; then I put my final finish on using Cutter's tape of different sizes and widths. Where there is a great retraction of the tissue I use the large and heavier tape; where the tissue is normal I use the small tape. On the tape I use Lapp emery with water and for my final finishing of the parts I use equal parts of tin-oxide and prepared chalk. On finishing the root surface of the tooth I never use the heavy emery, I finish the root surfaces with Lapp emery and conclude the polishing with tin-oxide and prepared chalk.

For finishing the cervical enamel surfaces I use orange-wood sticks, port polishers, jig polishers and Cutter's tape, carrying different grits. Caution should be used in all the instrumentation not to cause any more destruction of the tissue than necessary. The contact point should be protected and the normal tissue we should respect. When the approximal tissue is normal on the mesial or distal surfaces and in the taping of the cervical enamel margin of the teeth great precaution must be used not to injure the healthy tissue. At the completion of the instrumentation I wash the parts out with normal salt solution.

Treatment of Pyorrhea Alveolaris.
By M. H. Cazier, M. D., Chicago.

On Sept. 7th, I presented to the members of Dental Congress a patient for examination, diagnosis and treatment; the patient, male, age about fifty, fairly well nourished. Exploring the mouth, the gums are

bluish, puffy and around the teeth there is a well defined discharge of pus. History: About eight years ago, the patient noticed that the gums would bleed on slight irritation and aside from some tenderness, which has developed lately, there are no subjective symptoms.

The physical condition leads us to suspect that he has very prevalent disease known as "Pyorrhea Alveolaris" and examination confirms the diagnosis. The treatment of this malady to-day is considerably changed from the routine treatment which has been in practice for all of the years covered by the experience of dentists with this malady.

We should follow the signs and make accurate diagnosis. The pus welling up around the teeth as a guide and with proper exploring instruments, we should carefully note the location and the extent of the lesions or pockets and make record of the same. Then, before proceeding to surgical operation or scaling, the parts should be thoroughly drained by the use of some suction device. A flexible rubber cup should be adapted comfortably over the jaw and suction applied. Any mechanical means to cause suction may be used. After thorough drainage, we find the parts less tumefied, less blue and less sensitive, and the bleeding is less profuse—almost nil. This is a desirable condition, because instrumentation is now much more feasible and we are capable of proceeding with less difficulty. Then, after due instrumentation to remove the deposit from the teeth (being careful so as not to do violence to a live tissue) the patient should be directed to apply the suction according to directions once or twice a day, for the triple purpose of cleansing and of stimulating by massage (the gripping of the rubber cup) and for the very important purpose of drawing into the tissues normal, healthy blood, which revitalizes the entire structure, including the bone and soft parts, raising the resisting power, all of which aids the constructive efforts of nature to restore normal conditions.

In order that the disease may be eliminated and the supporting tissue of the teeth be restored as far as possible, the condition around the teeth must be made active, instead of passive. The disease itself is one of passivity. The tissues are undergoing starvation and it is our duty to feed and nourish, but in order for this to bear its perfect fruit, the lining of the lesions or pockets must be changed and when instrumentation has been performed, a week has passed; then, to stimulate growth of tissues by inducing an active condition of the capillaries, we install into the pockets one or two drops of a solution which contains about five per cent. chemically pure sulphuric acid, about ten per cent phenol in glycerine, water and alcohol, in which dissolve five grains each of ammonium fluoride and sulphocyanate of potash to each ounce. This, or a similar

solution, should be applied to the pockets once or twice a week for the purpose of destroying the pyogenic character of the lining and of inducing a flow of serum and plasma of the blood. This soon destroys whatever remnant of acid is left and furnishes nature the desired conditions for repair. Patients so treated recover healthy mouths in a few weeks, and from the very beginning of the treatmnt are protected against infection, because the mouth is rendered hygienic.

The Prevention and Eradication of Focal Infection.
By J. P. Buckley, Chicago, Ill.

This clinic emphasized the importance of so treating and caring for the teeth that *infections* about them will not ensue; and when infection is found in the mouth, the clinician demonstrated methods and means of removing it and preventing its recurrence.

The author's technique of resecting root ends and curetting and treating the involved area was given in detail. The indications and contraindications for apicoectomy were mentioned. Special attention was called to certain instruments designed by the clinician to assist the dentist in doing this work. These instruments consist of a self-adjusting spring tissue retractor, bone burs, bone chisels and curettes.

Several models of practical cases were shown where deep pyorrheal pockets have been cured by the somewhat radical method of slitting the overlying gum tissue and keeping it packed until the edges heal and contract, thus exposing the tooth root, which should be smoothed and polished so that the patient may readily keep the part clean. Other cases were illustrated with models where one badly involved root of an upper molar (it may be any one of the three roots) had been completely excised, leaving the other two uninvolved roots to perform the function of the tooth. Attention was directed to the importance of testing for the vitality of pulps in these badly diseased pyorrheal teeth, and thereby eliminating the possibility of a dead pulp in the tooth complicating the condition. Often a pyorrheal pocket will not respond to the treatment because of a gangrenous pulp in the tooth. This point should not be overlooked.

By surgically eliminating deep and otherwise incurable pyorrheal pockets, by removing and treating gangrenous pulps in these badly diseased teeth, and by completely excising a diseased root of an upper molar where the other roots are not badly involved, many seemingly hopeless teeth may be saved and kept healthy, comfortable and useful for a number of years. The clinician made it plain, however, that these methods should not be followed unless the end sought is accomplished. The ob-

ject here is to remove and prevent the subsequent occurrence of infections about these teeth. If this is not obtained the teeth involved, by all means, should be extracted. No tooth should ever be retained in the mouth which harbors infection either at the apical end or along the side of the root.

An Original Chemical Treatment for Pyorrhea Alveolaris.
By Dr. Josiah S. Bridges, Chicago, Ill.

The clinic was to demonstrate a persistent chemical treatment consisting of a liquid and paste for pyorrhea demonstrating the destruction by clinical analysis of all known pathogenic bacteria, especially conducive to the development of pyorrhea.

A thorough mechanical cleansing of the roots is absolutely necessary. A mixture of the liquid and pumice for scouring is especially advised at intervals during the progress of the treatment. This to be followed by an application of liquid to the infected parts using a glass tuberculin syringe.

Frequently there is considerable hemorrhage and if this is persistent it is best to dismiss the patient until a later sitting.

This liquid bath has been found to be a remarkably powerful cleansing and astringent agent.

LIQUID

R 5% trichloracetic acid,
2% adrenalin chlorid,
25% normal salt solution,
68% H_2O_2.

PASTE

Contains:

Zinc oxid, bismuth subnitrate, magnesium sulphate, Tr. iodin 35%, aconite U. S. P., eugenol, phenol crystals, alcohol and lanolin.

If possible it will be the clinician's pleasure to publish the proportions and methods used in obtaining a definite compound.

Before applying the paste, dry out the pockets and gum margins by isolation and by the very gentle use of air or bibulous paper points.

Fill an ordinary hypodermic syringe about two-thirds, fitted with a specially constructed flexible silver needle with a beveled point, by removing the cap covering the glass cylinder.

Gently insert the point of the needle well into the pocket, the beveled opening pressed firmly against the surface of the root, care being taken not to bring about hemorrhage, as the paste to give the best results must

be used in an area as free from moisture as possible. After all gross signs of pus have disappeared, and in cases of gingivitis spread a thin line of paste under the free margins of the gum and with the thumb and forefinger massage deep into the tissue. After treatment every other day over a period of ten to sixty days a clinical analysis will show the mouth free of all pathogenic bacteria known to be factors in the production of so-called pyorrhea.

Dr. Frank C. Pague, San Francisco, California.
A—Instrumentation in Treatment of Pyorrhea.
B—Use of Linen Thread for Movement of Teeth in Mal-occlusion, and as Temporary Splint.
C—Exhibit of Two Cases Treated and Retention by Gold Inlay Bridges.

A—The case treated—the left upper second bicuspid. The radiograph showed a pyorrhea pocket extending mesially two-thirds of the length of the root with discharge of pus on pressure. The instruments used were of the Younger set of scalers, and the Hutchinson set of small fine files for polishing surfaces after using the scalers, leaving the surface of the root smooth and free from all irritating deposits. I do not confine myself to any one set or make of instruments. The Younger set of scalers, the Hutchinson set of scalers and fine polishing files, and the Carr set of scalers are constantly before me to be made use of as necessity demands. After I have finished my instrumentation of a tooth I do not return to that tooth for any subsequent treatment, but place it in a state of rest, often supporting it, if necessity demands, with a splint of fine linen thread (No. 00), and let Nature do the rest.

B—In my demonstration of the use of fine linen thread (No. 00), as a splint for an elongated central, I tied my thread with a double surgeon's knot high on the right upper cuspid and made it taut by a single knot on my surgeon's knot; then passed to the right lateral tying it in same manner at the neck of the tooth and so that the thread could not slip. The left cuspid, lateral and central were tied together in the same way. After finishing my tie on the left central, the ends of the strings were left long enough to be engaged in the loop that was tied low on the crown of the right central (the tooth that was elongated). This loop included one string from the tie on the right lateral, and then these strands on either side of the elongated tooth were tied taut, while my dental nurse forced the tooth back into its socket and held it firmly until the tying was completed. This case I treated one year ago and I have not seen the patient in six months, until to-day. The threads were removed two or three times for prophylactic treatment during the first six months and

then the tooth was so firm that further support was not necessary. The radiograph taken to-day as a part of this exhibit shows the vast area originally involved, and Nature's effort in the upbuilding of the new tissue to this time.

C—First exhibit:

A young woman, thirty-two years of age, lost left inferior centra from pyorrhea, the left lateral was badly affected from same cause, as well as the right lower central. Both of these teeth were very loose after treatment, but both had healthy pulps, so were used as abutments to replace the left central. Cavities were cut in the lingual surface of each tooth from the cutting surface three-fourths the length of the crown, when a step was cut squarely across the surface; then a groove was cut close to the enamel edge, on either side from the tip to the step, and in this groove on either side of the pulp, extending beyond the step two parallel holes were drilled three-sixteenths of an inch deep, together with one at the tip in the center of the tooth and in line with the two lower ones; then an impression was taken of each cavity with inlay wax, and gold backings were cast to accurately fit these lingual surfaces, to which was attached the porcelain dummy with gold backing, to supply the lost central.

C—Second exhibit:

Lady of forty years of age. Upper central incisors were so badly affected from pyorrhea that the right central was removed. The first molars were lost twenty years ago. The second bicuspids had moved back until in contact with the second molars, and the first bicuspids followed; likewise the cuspids, with some space between them and the first bicuspids; the laterals followed the cuspids in close contact, leaving the incisors somewhat separated, and the space of a lateral on either side of the incisors and laterals. The right central was so badly affected that it was extracted, and then with fine linen thread (No. oo), the left central was moved over until in close contact with the left lateral, and held in this position by a splint made with fine linen thread (No. oo), for some three months, and then gold inlay backings were made for the lingual surfaces of the left central and right lateral (as in the first exhibit), which were the abutments for the bridge that supplied two porcelain dummies to fill the space. The radiograph shows clearly the effort of Nature in the upbuilding of new tissue about the central root in its new position. The bridge is firm in position and promises many years of usefulness.

Surgical Treatment of Pyorrhea Alveolaris.
By Dr. Jean Cline, Portland, Oregon.

The operation was performed on an upper right central incisor and consisted of first rendering the field of operation aseptic, then by the use of fine stones, sand paper strips and fine disks, the crown of the tooth was brought to a high state of polished smoothness, all roughened surfaces were polished off and all angles were reduced to graceful curves. Then with instruments, acting as planes, the portions of the root, from which the connection of the tissue had been destroyed by the action of the disease were carefully planed, all deposits being removed in the course of the operation. Following that, the cervical margins of the tooth were polished by the action of a polishing material of oxid of tin and whiting, incorporated in the fibres of a flat waxed tape, and after again washing out the pockets with an antiseptic solution, the operation was completed.

Treatment of Pyorrhea Alveolaris, Showing Method of Scaling, Curetting and Polishing.
By W. A. Atwood, San Francisco, Cal.

My subject was a man fifty-five years of age who had pyorrhea in an advanced stage in every tooth.

I selected the left upper central and lateral which were in a very bad condition, with pus flowing freely from the deep pockets on the mesial and distal surfaces. I thoroughly curetted these pockets and scaled and polished the teeth, and I feel sure that he will have immediate relief, notwithstanding the fact that he has had trouble for the past five years.

I also endeavored to show, by having present several natural teeth which I had extracted (some of them from young people), the natural defects in the enamel at the gingival border of teeth which exist in a large percentage of all mouths and which, to my mind is the first lodging place for calculus.

I can see no excuse for letting this trouble mature when it can easily be corrected early in life. I also pointed out with specimens overhanging margins of amalgam fillings and ill-fitting crowns, both gold and porcelain, which would always create and produce an inflammation of the gum tissue, suppuration following. Again it is within the providence of every dentist to greatly assist his patients by looking for these very conditions, which I believe are present in nearly every patient's mouth. I also think that dentists in future will do less crown work, and what they do will be better and more skilfully done, and I know from personal experience that they will look to the cervical margins of all amalgam fillings.

As for the treatment of pus pockets, in the percentage of cases when the real cause is removed, viz., calculus, and the imperfections on the tooth, Nature is always ready to do her part if given a chance. Very little medicine is needed, and in many cases, none at all. A general massaging of the gums and a thorough cleansing of the mouth generally restores the gums to a healthy condition.

Prophylaxis and the Importance of Instructing Our Patients in the Technique of Maintaining the Same.

By Arthur E. Peck, Minneapolis, Minn.

Statistics and history of clinical cases were given to show the close relation of our work to the general health of the public. Clinical cases were cited showing the direct connection between mouth infection and the general systemic conditions appearing in the form of rashes, acute indigestion, ulcers of the stomach, nephritis, neuritis, rheumatism and many other serious diseases.

These physical derangements from mouth infection occur usually two or three months after the patients have had their teeth taken care of, which might indicate that they had not been properly instructed in the technique of maintaining mouth hygiene.

Mouth health being the main object of this clinic, the importance of teaching our patients the technique of using the tooth brush and mouth hygiene outfit correctly was thoroughly demonstrated. They should be taught the importance of selecting a tooth brush so shaped that it will fit the inner side of the teeth. The bristles should be set in the handle in such a way that the dirt can be easily removed.

A new method tor using the tooth brush was demonstrated in the mouth showing how to entirely eliminate the possibility of infection from the ends of the bristles injuring the gums.

The method of cleaning the bristles with a cleaning fork was also thoroughly explained. The use of a massage stick, in removing the plaques which form on the teeth, was demonstrated in the mouth. The efficiency of a tongue scraper was made clear and its importance shown as an aid to our patients in maintaining mouth hygiene.

Six Steps in the Surgical Treatment of Pyorrhea.

W. Claude Adams, Portland, Oregon.

1—Examination.

First, locate the cause of the pyorrhea, ascertaining whether the condition has been brought about from calcareous deposits, overhanging margins

of fillings, ill-fitting band crowns or by malocclusion or excessive tooth strain.

2—Cleanse the Field. Thoroughly cleanse the field, making it as nearly aseptic as possible. Remove any superficial deposits, crowns or any other irritating factor.

3—Polish off Crown of Tooth. The tooth, in its natural state, has a rough and uneven surface which furnishes a foothold for débris, mucin plaques and calcic crown.

By means of fine stones and discs, polish off the crown.

4—Plane off Root. With proper instruments, plane off the deposits of serumal calculus on the root, going to the apex, if necessary, until the root is perfectly smooth for the reattachment of the bony tissue.

5—Polish Neck of Tooth. Polish neck and root of tooth with jig polisher and with flat dental floss charged with fine powder.

6—Final Polish. Polish the tooth crown to an ivory finish with tin oxid and whiting, rouge, etc., using moose hide discs and felt wheels for the high polish.

Prophylaxis and Periodontia.
By Austin F. James, Chicago, Ill.

Dr. Austin Flint James demonstrated his methods of prophylaxis and corrective treatment of pyorrhea alveolaris on several patients who presented with the disease in various stages of advancement.

Dr. James has evolved an original technique and in this clinic he followed in condensed form the same methods that he has used for instructing other dentists who have studied under him. In addition to the technique he explained the uses of the planing instruments of special form which he had produced for the purpose.

Particular emphasis was placed upon the contributing causes of pyorrhea, such as malocclusion, improperly finished fillings of crowns, or generally unclean conditions.

It was shown that Dr. James's technique furnishes an unmistakable proof as to whether or not the professional efforts of the dentist are successful. Furthermore, by co-operation with the patient, Dr. James is able to prevent any recurrence of diseased conditions.

Most of the mouths which are attacked present a generally broken down condition requiring extensive restorative measures. The demon-

strator illustrated by actual examples several interesting cases and explained the folly of using fixed bridges, since they prevent the effective prophylactic measures which must follow the successful treatment.

Joseph Loran Pease, Oakland, Cal.
(A) Dental Nurse.
(B) Aids and Conveniences.

The many duties of the dental nurse were outlined and in addition, this clinic consisted of a demonstration of the Black-Mason chisels in a set of twelve.

One hundred and twenty old-style chisels of various shapes and lip bevel were shown, and it was demonstrated that operative procedure was more accurate with the former than the latter.

The use of a large cotton container such as used by the throat specialist was advocated as it holds a larger supply of cotton and a cover prevents contamination.

Clinician suggested the use of fine silk No. 60 as an aid in carving wax for the inlay.

For the purpose of demonstrating the greater need for care in decaying teeth and abscessing areas three unusual post-operative cases were shown. Each with a marked different individual constitutional disturbance.

Case 1. Mr. F. M. P., age 46 years—Alveolar abscess at apices of lower second molar, draining into the inferior dental canal causing throat infection, accompanied by extensive swelling of the sublingual tissue.

The inferior dental nerve and artery uncovered by extensive necrosis. The singular feature was that no pain has been experienced by the patient from the first and extending over a period of seven weeks, but rather that a numbness pervaded the area, with a slight prickling sensation at the lower lip. Syphilis eliminated, as the Wassermann showed negative. In this case the trouble was traced to an infection from the putrescent root.

Case 2. Mr. O. J. N., age about 35 years—Trouble became apparent two months after the partial extraction of several teeth, roots having been left by a careless operator. Gums healed over after some delay, the pus, no doubt, draining into the inferior dental canal and the egress of the infective material through other channels was shown in lesions of the skin similar to those of poison oak. Later several boils appeared more espe-

cially about the head and neck. The lower limbs were covered with dark discolorations. Constitutional disturbance marked by skin disturbance.

Case 3. Mr. A. L. A., age 51 years—Sinus opening just beneath the eye, draining an abscess at the apex of the cuspid tooth. Facial blemish, a result of opening the abscess by a surgeon some two years previously and in not referring the patient to a dentist for treatment.

Pyo-Laxis.
By Dr. C. A. Philpott, Boise, Idaho.

The subject of this clinic, pyo-laxis, has a twofold meaning in that it comprises a treatment which cures pyorrhea and also puts the mouth in a prophylactic condition which is most easily kept in that condition

All roughness is removed from the exposed surface of the tooth and all angles are reduced to graceful curves with Gem and Arkansas stones and fine strips and discs.

The contact points are then corrected as much as possible and all cavities that are not too deep should be ground out. Next all deposits and softened tooth tissue are planed from the detached portion of the root. And interproximal spaces are also corrected.

The exposed portions of the tooth next to the gum and interproximal surfaces are then polished with fine polishing powder on silk tapes.

The remainder of the crown is then given a very high polish with wood points and leather buffs in the engine, using fine polishing powders and rouge.

The patient is then taught to clean the teeth with a silk tape which if properly done will thoroughly cleanse the tooth and thus prevent the return of pyorrhea and also prevent decay.

Crown and Bridgework.

Porcelain Shell Crown Operation.

J. E. Argue, Tacoma, Wash.

Consists of grinding the enamel and shortening the tooth from three to three and one-half millimeters, grinding to an approximate cone shape and forming a shoulder under the gingiva about one millimeter wide. The shoulder is definitely formed by using a No. 56 or 58 straight fissure bur and planed smooth with a hoe excavator. Sheet platinum 1/1000 in thickness is then cut to measurement taken previous to grinding, allowing one-half millimeter lap on lingual and same on the incisal, using no solder. This is festooned mesially and distally and placed in position, using wet cotton and orange wood with a mallet to force the matrix to adaptation. A seamless copper ring is then fit to position over the preparation with adapted matrix allowing ample room between copper ring and the matrix; the ring is then fit into an ivory separator by drilling a hole in the lingual and labial sides, and modeling composition is softened and placed on bows of separator; it is then forced to place, the modeling composition attaching to the adjoining teeth which holds the copper ring in position.

In the ring is placed gum camphor and with orange wood is malleted fully; this compresses and swedges the platinum matrix to the prepared root end.

This is then removed, the ring engaging the matrix and removing it from the root end without disturbing it in the least; the gum camphor is burned, leaving the matrix free. It is then ready for the first bake of porcelain.

Brewster foundation body is then mixed combining colors to give the proper varieties of colors from the gingival to the incisal and building the piece in two to three bakings, matching in color the adjoining teeth and conforming in type to match its fellow tooth.

When the contour and occlusion is approximately restored the enamel coat of the proper shade is then added and given the final bake, which is brought to a high glaze. Matrix of platinum is then removed and this surface is etched with hydrofluoric acid. The overhanging porcelain is then ground off at the gingival and polished with cuttlefish discs. When properly fitted it is ready for cementation.

The Use of Porcelain Jacket Molar Crown as an Abutment in Bridgework, and Porcelain Gum Restoration.

By Edward B. Ducasse, D. D. S., New Orleans, La.

We first prepare the root in the customary way; we then take measurements and make a platinum ferrule of thirty gauge and festoon and contour same to conform to the general outline of tooth, restoring the

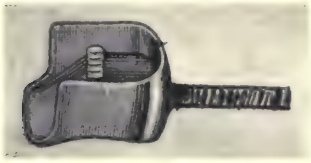


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

interproximal space and contact point. The next step consists in cutting out the buccal aspect to the gum line, and to the mesio-buccal angle and the disto-buccal angle. We now place this partial ferrule on the root and grind the buccal portion beyond the free margin of the gum with a carborundum stone, keeping the stone wet by the aid of a sponge carried on a suitable sponge holder.

Having accomplished this, we remove the band and tack with sticky wax a platinum floor of forty-six gauge and place same on root, burnishing this floor thoroughly on the root with a pear-shape burnisher; we then pierce the floor with a sharp pointed instrument for the reception of a dowel or dowels, as the case may be. We now place and tack with wax, our dowel in position, and try in work for final adjustment. Upon removal, we invest in Standard investment, and after boiling out of wax, we solder floor and dowel with platinum solder.

The dowel should extend into the vault of this mechanism, serving as an attachment for the porcelain; at the same time we solder a platinum

Fig. 6.

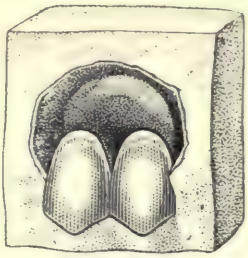


Fig. 7.

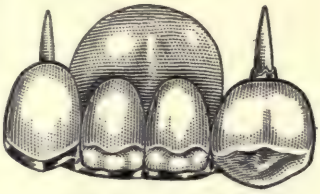


Fig. 8.

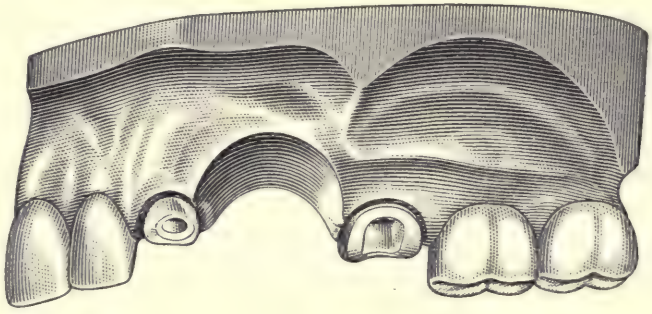


Fig. 9.

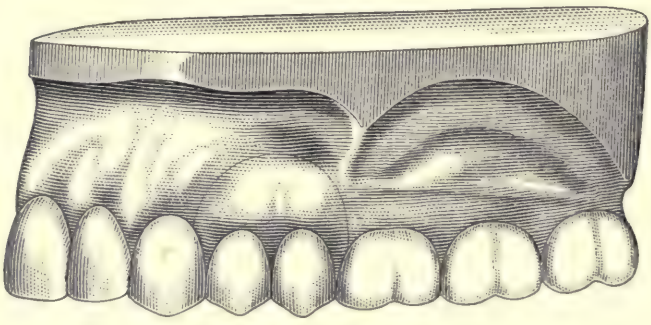


Fig. 10.

wire of about fourteen gauge on the lingual surface temporarily; this wire will assist in holding the frame in the hand vise during the manipulation of the porcelain. Figure 1 shows the frame ready for the reception of the porcelain. Figures 2 and 3 show finished crown. Figure 4 shows case ready to receive crown. Figure 5 shows crown cemented to place.

Use in Bridgework.

Since the mesial, distal and lingual surfaces are not restored by fused porcelain, such a crown can be used as an abutment in bridgework as follows:

This porcelain jacket molar is placed in position, a Richmond crown having been constructed for the cuspid, is also placed in position; an impression and bite is then taken.

The dummies selected should be a trifle longer than the adjacent teeth—they are set in alignment, articulated and waxed together, and invested. A slot of iridio-platinum is placed over pins and soldered—we now carve and contour our wax to the desired restoration; it is then removed and the lingual surface is covered with platinum foil. Figure 6 shows case ready for investment. Fig. 7 shows investment after boiling out of the wax. Fig. 7 allows the operator to press porcelain body in position. Having obtained the final firing, the investment and platinum foil is removed.

The next step consists in making a cast backing and the porcelain gum restoration is then cemented in place.

Fig. 8 shows the finished bridge.

Fig. 9 shows the case before cementation.

Fig. 10 shows the bridge cemented.

Cast Aluminum Crowns with Porcelain Facings.
Dr. George D. Sitherwood, Bloomington, Ill.

The root of the tooth is prepared in the usual manner for the reception of a crown with very narrow band and post. The labial side is always beveled so that the porcelain may be closely adapted to the end of the root and gum margin. A platinoid or German silver post of the proper diameter and length is then fitted to the root canal. For an upper first bicuspid, two small posts as a rule should be used.

When the post is properly fitted and trimmed, an impression and bite is taken with a piece of good modeling compound. By using one piece of compound, much time is saved. A little wax should be flowed over the portion of the pin which enters the root canal, and which has been removed with the impression. From this impression and bite, a plaster model is made on a smaller articulator.

Any good inlay wax is now used to fashion the crown. Before beginning, warm the plaster model sufficiently to permit the pin which was slightly waxed to be removed and again replaced in position on the model. This will facilitate its further removal with the wax model when completed. An ordinary porcelain flat-back with platinum pins is used, the holes in the model being preserved by graphite points of the same size as the platinum pins, which are placed in the holes after the flat-back is removed from the wax model. A narrow rim is fashioned on the wax model on the lingual side, which protects the root instead of a band.

When the wax model is completed, it is removed from the plaster cast and articulator; the porcelain flat-back is removed, and the holes in the wax plugged with small graphite points as previously mentioned. A sprue former is inserted on the lingual side and the model invested in a casting flask in usual manner as for a gold inlay, only the investment material must be much coarser.

In casting, the flask should be cold, after the wax is burned out just enough to insure a good cast, as overheating will make a rough surface. Three pieces of pure aluminum plate is best for melting; number twelve gauge plate cut into three-quarters of an inch square. The best results in casting have been obtained by the use of a good vacuum casting machine, although a centrifugal machine will do for those who are familiar with that method. Care must be taken to use only sufficient heat with a small blow-pipe to melt the aluminum to the proper point, as it is easily burned and thereby rendered worthless.

If Steele facings are used the backing should be made of thirty gauge platinoid plate, the usual pliers or punch machine being used in making the backing, which must be small enough to double back in triangle shape. The post will pass into the triangular space and after the wax is burned out the aluminum will flow around the back and make a perfect mechanical union. Do not attempt the use of gold as it will invite failure.

After casting, the crown is trimmed and polished in the same manner as a gold crown. The soft graphite points are drilled out, the porcelain facing cemented in place, and the crown cemented on the root with any good hydraulic cement. A Steele facing would be cemented in place in the usual manner.

The advantages claimed for these crowns, which are only recommended for the six anterior and bicuspid teeth, are:

1st—Their utility and perfect adaptation to the root.

2nd—Their natural and esthetic appearance, durability and small cost of material.

3rd—The facility with which they can be made.

Porcelain Jacket Crowns.
By Hugh Avary, San Francisco, Cal.

This clinic on porcelain jacket crowns was given to show the wide field in which they may be used to advantage. When properly made they are ideal from the esthetic as well as the prophylactic standpoint.

The jacket is the ideal crown for several reasons. It is not necessary to devitalize the pulp except in cases of exposure at the commencement of the operation. It is the most natural looking crown and possesses the greatest degree of translucency. Also detail individualities may be reproduced in jacket crowns to correspond with the natural teeth.

Jacket crowns are indicated in the following cases: Peg laterals, malformed or discolored teeth; when a tooth is over one-third broken down; badly eroded teeth; deciduous teeth that remain in adult mouth; (radiograph case and ascertain that there is no unerupted tooth under deciduous tooth). Jackets may also be used to advantage when opening the bite. All gold crowns that irritate the gums should be replaced by jacket crowns; teeth that are rotated may be corrected by jacketing. Root crowns that are ill fitting may be split off leaving post in root canal; cut shoulder on root and jacket.

Case No. 1. Man, thirty-one, superior centrals badly eroded, vital teeth, appearance greatly improved by jacketing.

Case No. 2. Lady, twenty-four, upper centrals, right vital, left devitalized (when case presented), and discolored; teeth badly pitted and filled; centrals were jacketed, correcting slight protrusion.

Case No. 3. Lady, thirty-two, upper left lateral, ill-fitting pivot crown was removed; gum had reached about three mm.; crown was split off with thin carborundum stone and shoulder cut around root. Jacket was then made to lap corresponding to right lateral.

These practical cases were shown for examination. Models of several other cases "before and after" were also shown. Limited space prevents going into further detail.

Tooth-Staining.
By Jas. S. Ruyl, New York.

It often becomes necessary in order to get an artistic and natural effect in unusual colored teeth, where a crown, bridge or partial plate is required, and it is impossible to make the proper selection from the teeth in stock, that the staining or painting of the teeth must be resorted to.

In order to accomplish this to defy detection the crown or tooth must first be recut and fitted to its abutment and all the glazed surface removed with a coarse disk and finished to a semi-polished surface with the cuttle-fish and finally polished with pumice and whiting; this permits the surface to accept the colors which are put on with a fine artist's brush and then diffused over the surface with the finger. The paints used are "Lacroix" French China paints, softened with lavender oil. The colors necessary for most cases are black, brown, yellow brown, ivory yellow, ivory white, celestial blue and rose pink.

After the required results are obtained the tooth is placed in the oven and baked to 1700 degrees of heat, when it can be removed. Most beautiful bone-like effects are the result, with very little labor and time expended by the operator.

An Accurate Method of Contouring and Casting a Molar or Bicuspid Crown and Constructing Sanitary Bridge.

By Dr. D. S. Gardner, Sacramento, Cal.

When it becomes necessary to crown a tooth, instead of using an inlay, as a bridge abutment, the tooth should be devitalized and carefully prepared by removing the enamel, making the sides parallel, and thoroughly polishing the stump under the gum margin.

Following this preparation, the surrounding tissue should be treated and allowed to return to its normal condition before fitting the band. Rapid methods often lead to failure, as too little attention is given to treating the gums which is undoubtedly the reason why so many crowns and bridges fail.

The measurement of the tooth is taken with fine wire and the band made larger toward the occlusal surface than where it fits around the stump, thus allowing for proper contouring, using Peeso's stretching pliers to restore the interproximal contact point.

The band should be made to fit slightly above the gingival margin, and when in position, an impression and bite taken with proper amount of Kerr's Modeling Compound to obtain the occlusal surface.

An instrument is used to remove the band with the impression and the former partly filled with wax so that when running the model the plaster does not fill the band.

After the articulation is made with plaster it is separated, the wax removed and band filled with Kerr's casting compound, and when hard is carved to allow for the thickness of the gold that is required.

Parr's hard flux wax is flowed around the edge of the gold and pink base-plate wax slightly softened and pressed over the casting compound

and band. Kerr's casting wax is now flowed over this and the occlusion obtained.

When carving, care should be taken not to cut into the pink wax so as to retain the desired thickness for the cusp.

When invested and cast it is possible to produce a crown accurately constructed with the minimum amount of gold or with any desired quantity.

Technique for Bridge.

All bridgework is greatly simplified by using the casting method and with so-called sanitary bridge or one without facings, the construction is made almost as easily as when making a crown and is more satisfactory to the patient.

The bands are in position in the mouth and impression and bite taken with plaster. These are waxed, articulated, filled with casting compound and carved, same as is done for a crown.

The Parr's flux wax is flowed around the edge of the bands and the pink wax instead of covering the single band is carried over both abutments and intervening space. The Kerr's casting wax is melted over the pink as for a single crown and the occlusion obtained.

This is carved, invested and cast and the shrinkage of the gold is so slight it does not interfere with the bridge going in position, especially if Kerr's investment compound is used.

Bridges with inlay abutments are of far more difficult construction as the inlays must fit perfectly when the bridge is in position. The cavities are prepared with decidedly bevelled margins so that the gold may be readily burnished to the tooth. When the anchorage requires greater strength nineteen gauge clasp gold posts are used.

After getting the impression and bite with plaster, care should be taken to place the inlays in exact position before running the model.

In the construction of the dummies, individual platinum saddles are generally used and as much porcelain as possible so as not to interfere with the strength of the bridge.

The lingual surfaces are restored by casting so that when completed the labial, buccal and lingual surfaces are anatomically correct.

The dummies are waxed together before casting so as to restore the septal area. This facilitates cleansing and produces a more sanitary bridge.

Instead of casting to the inlays, these are soldered that the shrinkage may be controlled.

"Removable Bridgework".

By Dr. F. E. Raiche, Marinette, Wis.

Case I. Supplying the lower right second bicuspid and two molars place a shell crown on left and right first bicuspids, attach Morgan attachments to distal side of right bicuspid as far to the lingual as possible and another on mesio-lingual corner of left bicuspid. Now using a wire fourteen gauge round, iridio-platinum, or clasp gold of length from first left bicuspid to first right molar, shape to curve of arch, turn left end up at right angles about five-sixteenths of an inch or to locate bar just above tongue muscle. Solder this end to key of Morgan attachment, solder a lug to other end and allow it to anchor in vulcanite.

Case II. Supplying the lower two right molars; place shells on both bicuspids, solder together, attach a Morgan attachment to distal side of second bicuspid and an open tube between lingual side of crowns, open side facing distally. Tube attachment is made by taking a piece of iridio-platinum tubing, round, slightly smaller than fourteen gauge round wire; open seam until it fits wire, cut to about length of crown and solder to crowns. Bend a piece of clasp wire at right angles, length of tube, attach to face a short piece of the wire for the key intervening between a piece of plate to allow space for tube to work in; extend other end of wire into vulcanite; place Morgan attachment and vulcanize.

Case III. Supplying in lower jaw the teeth missing back of cuspid on one side and lateral, cuspid and first bicuspid and two molars on the other side. Excise crown of second left bicuspid, make for it a Richmond cap and post; then excise left central and make for it a Richmond complete. Make for the right cuspid a complete Richmond or shell. Attach an angle bar to the cuspid distally, a bar from the left central and over the bicuspid cap and over the ridge half an inch. Place a Gilmore clasp on the left bar back of bicuspid anchorage; another on the bar back of cuspid on the right. To prevent the plate sliding backward, before connecting the right bar to crown, solder a piece of the bar wire one-sixteenth inch long to the top extreme end of this bar; file to cone shape and round off. Finish up in vulcanite. Pack case before placing clasps. Just before final closing of flask fill clasps with cement and place in position on wires just enough to grip wire. In this position they will allow plate to settle on the soft tissues. After case is vulcanized, with a round bur size of wire, cut grooves deeper to correspond with position of clasps.

Case IV. Supplying the two bicuspids and molars on upper left side; place a shell, open face shell or Richmond crown on upper left cuspid, a shell on right second bicuspid. The first bicuspid being also missing I placed Morgan attachments on mesial side of bicuspid and distal side of cuspid using a heavy gold plate saddle to carry the supplied teeth. The palatal part of plate was made as narrow as possible, keeping away from anterior teeth about three-eighths of an inch. The plate carried on the right side a lone first bicuspid, this being just enough to give it balance. In case of no teeth being missing from one side I would recommend a lock attachment or telescope crown.

Temporary Bridge for Deciduous Teeth.
By Dr. Maude Tanner, San Francisco, Cal.

A new thought on the restoration of the bite, occlusion, masticating surface, and maintaining the space, also prohibiting the elongation of the opposing teeth, as well as preventing the tipping of the permanent teeth; assists in the preservation of facial contour and the restoration of natural functions, assisting nature in the absorption of the roots of the remaining teeth in contact and occlusion, by giving them work to do.

In fitting the little caps for abutments, the teeth are not touched with stones, nor otherwise mutilated. They are polished thoroughly, and put in as sterile condition as possible, before cementing the bridge to place. A close watch of these cases is necessary, and models made for study and observation, every few months. If patient is growing rapidly, the case may warrant the removal of the appliance for readjustment, according to requirements.

In case of falls, accidents, or otherwise early loss of the temporary teeth, I would not hesitate to put on an appliance of this kind, if indicated, as by so doing, I would in many cases prevent orthodontic operations, also giving normal functions of mastication on both sides of the mouth equally, where, if even one tooth is missing, the patient will naturally masticate on the opposite side, causing dental caries and abnormalities, as well as forming the habit of masticating on only one side of the mouth.

The length of time for the retention of an appliance of this kind is governed by the loosening of the abutments where deciduous teeth are used. The little bridge has done its work and is now ready to be removed.

I would not hesitate to put on an appliance of this kind wherever indicated, provided I could see the case at least once a month.

The idea of an appliance of this kind is purely original, as far as I know, not having heard anyone advocating such an appliance.

Starting of a Richmond Crown.
Short and Accurate Method.
By Dr. James J. Carey, Honolulu, Hawaii.

Place cope and dowel on root. Take a small piece of dental lac, place over cope and dowel; while warm mark with finger nail, chill with cold water, remove dental lac, take cope and dowel from root, place back into dental lac, take small piece of moldine, place over dowel and into cope. Take hold of long end of dowel with pliers; put small flame on long end of dowel; harden moldine slightly and soften dental lac at same time. Remove dental lac, place heat then on cope and dowel on short end of dowel. Burn moisture out of moldine, and solder. Take medium large piece of 18k. solder, lay against dowel and on floor; apply heat from below; when solder drops, place heat above and solder will run around dowel.

If heat is placed on moldine and dried out too much it will raise cope, and you will find your dowel is a trifle too long, but if placed above on cope first, it will drive the steam from underneath your cope, will not raise it, and your dowel will not be too long.

Place back on root and it will fit perfectly. You will need no impressions whatever. Take a bite and you are ready for your final work.

Setting Logan and Twentieth Century Crowns With Evans Gutta-percha Cement.
By Dr. James S. Dean, Redlands, Cal.

After the root is prepared and filled, space made for the pin and the crown ground to fit end of the root, proceed as follows:

Warm iron crown block to point where it will cause water to boil. Varnish pin and crown end with thin solution of resin and chloroform. Place on block to warm, mix gutta-percha cement on warm crown block and coat pin and crown. Spray root with water and push crown pin carefully to place in wet root. Remove and notice impression of root in cement. With stump wheel grind away cement and edge of crown exactly to edge of root impression, thus making the crown the exact circumferential size of root end. If too little cement has been used, wash the cement in alcohol and add more. Place crown on block to warm. Dry canal. Varnish with resin and chloroform; press crown to place and allow a little time for cement to cool. Trim away the slight excess with a lance and operation is complete. The resin solution makes the

cement stick to the crown pin. The wet canal prevents the cement sticking in the canal and the resin solution in the root binds the cement to its place. The crown can easily be removed by using a copper crown warmer heated in gas flame, and it can be taken out with bayonet forceps or fingers.

Iridio-Platinum Cones Used Instead of Posts in Construction of Porcelain Faced Crowns.
By Dr. W. A. Hoover, Gibson City, Ill.

From twenty-six to thirty gauge iridio-platinum plate—form with pliers over small instrument a hollow cone to approximately fit the enlarged root canal—leaving the part projecting from the root flattened. In this part punch holes for the pins of the facing—cover facing with a thin backing of pure gold—then place on cone and fasten not too rigidly by bending the pins slightly, leaving the opening in the cone exposed lingually so that the sprue former may be inserted for withdrawing the piece from the root. Fill the cone with casting wax—build up cone with same—press into place—remove, trim and cast in mold as near melting point of gold as possible.

In anchoring an inlay to be used for support of a bridge, the cone is used—building the wax over it. The advantage being that by inserting the heated sprue former into the cone a reasonably tight fitting post can be withdrawn without danger of distortion or disturbing the relation of filling and post.

Restoration of Vital Lower, Posterior Teeth With Gold Band and Porcelain Cusps.
By Dr. Geo. W. Kevner, Racine, Wis.

When called upon to restore a badly broken down lower molar or bicuspid having a live pulp, the customary procedure has been to devitalize and extirpate the pulp, fill the root canals, and crown, by one of the various methods.

Experience has shown that many root fillings prove faulty, and frequently become a source of metastatic infection.

Obviously, then, we should avoid the root fillings and conserve the pulp whenever possible.

The occlusal surface of lower molars and bicuspids being the only visible surface, we can, by using a porcelain cusp crown, not only preserve the pulp, but at the same time restore the tooth to its natural appearance and normal use.

The first step is the cavity preparation.

Excavate decay, and if it lies close to the pulp, apply a small quantity

of albargin to the surface of the decayed dentine, and cover with temporary stopping. At the next sitting all the decay will be definitely outlined, and its removal facilitated, eliminating the danger of exposing the pulp in the search for decay.

Next cover the walls near the pulp with a mixture of bayberry wax and iodoform. The wax should be melted and the iodoform incorporated and the mixture allowed to cool before using. It is best to keep a small quantity on hand. Cement is next placed over the wax and the remaining cervical portion of the cavity restored with amalgam.

The walls are prepared as for a gold crown, using a carborundum stone with a stream of warm water to prevent heating the tooth. Measurement is taken and gold band made, the ends being joined by sweating. The inside near the occlusal is reinforced with solder.

Care must be taken in fitting the band to the tooth to adjust it below the free margin of the gum, but not forcing further. The height of the band is determined by the space between the occluding uppers and the band. Sufficient space must be allowed to give proper body to the porcelain. The band must be cut low enough to allow for this. The top of the band must not in any case end at the contact point, but should be either above or below.

The band is now placed on the tooth, and the occlusal surface fashioned of baked porcelain or synthetic porcelain at the option of the operator. If baked porcelain is selected a suitable matrix of gold or platinum is burnished into band, being allowed to project over the edge of same. The matrix is then removed and porcelain built into the desired shape, preceding as for ordinary porcelain inlay. A groove may be ground in the reinforcing solder on the inside of the band, and the retentive portion of porcelain etched with hydrofluoric acid to provide additional retention.

To prevent irritation and subsequent deterioration of the pulp, before setting the band with cement, the entire area of the exposed dentine should have a thin coating of medicated chloro-percha, which should be dried with warm air. Band is now cemented to place and excess removed. Porcelain is then cemented to place in the band, and the restoration is complete.

If silicate cement is to be substituted in place of the baked porcelain to reproduce the occlusal surface, the reinforcing solder in the band is grooved or serrated, and the band is then cemented in place with oxyphosphate. Rubber dam is applied isolating the band and the two adjoining teeth. Proceed as if for a synthetic filling, contour and allow to set.

After removing rubber dam perfect contour and articulation, using for this purpose rubber discs, strips and stones lubricated to prevent heating. When articulation and contour are normal the restoration is complete.

The Preparation of Roots Where a Band is Indicated.
By Dr. J. Elton Lang, Los Angeles, Cal.

The preparation of roots for gold crowns and other crowns where a band is indicated, is accomplished by the use of scalers, chisels and burs.

The enamel, as you are all aware, is made up of hexagonal prisms with their axes radiating from the center of the tooth. In order to have the desired cone shape on which to properly adjust a crown, I remove all the enamel prisms.

Mode of Procedure.

If the tooth to be crowned has not a cavity in the occlusal surface, I make one by the use of a spear pointed drill. Then I take a round bur No. 4 or No. 5, and cut away the dentin close to the enamel, chipping off the enamel as I proceed, in this manner reaching the walls of the tooth. I find cross-cut burs best for this work as they seem to cut faster.

In cutting down a tooth that has been devitalized, I aim to cut half the crown away, using the round burs to cut the dentin, and when the enamel is reached, I use a spear pointed drill to make three or four holes in the walls of the enamel.

My next step is to use an instrument that will enter the holes made by the spear pointed drill. The instrument should be placed in the hole from without inward, using it as a lever, the force being directed upward and inward, thus breaking off the greater part of the enamel. Carefully avoid using too much force. If the enamel does not break easily, you will no doubt find either that you have not removed enough of the dentin next to the enamel walls, or you need one or two more openings made by the spear pointed drill. Never pry the enamel away from the tooth.

After you have removed the upper or occlusal portion of the tooth, we come to the point that seems most difficult, the removal of the enamel of the sides of the tooth, especially that which lies near the gingival margin.

You will notice I am not using any carborundum discs or points and very rarely do I find them necessary in preparation of roots for crowns. I operate with burs, drills and scalers, making it a particular point to keep them sharp.

In removing the side enamel I use scalers, starting with a right

angle chisel scaler, followed by a right angle spear pointed scaler, chipping off small portions of the enamel prisms. The prisms will break off at the sub-enamel membrane, which lies between the dentin and enamel. Do not try to break off too much enamel at a time. If you do, your work will become complicated. When you find this condition, drill the dentin next to the enamel away and remove the wedge part of the enamel with a chisel and proceed as before.

It will be surprising how quickly this work can be done. I use a variety of scalers in my work. Any kind of a scaler that will help you in this work is certainly a valuable adjunct to your list of instruments.

We all will agree that we must remove the enamel in nearly all cases to get the cone shape, upon which to properly adjust a crown. It should fit tightly below the gingival margin; and when it does, there will be but very little possibility of the gums receding. This has been my *modus operandi* for many years, and if those of you who are grinding teeth down with carborundum stones, will try the scalers and burs, I am sure you will find your work more satisfactory to yourselves and to your patients.

Building Up Abutment on Fractured Root for Richmond Crown.
By Dr. H. D. Smith, Alameda, Cal.

First; Remove the loose piece of tooth, which is generally found adhering to the gum; wash and cleanse, placing it in a little peroxide to take off all blood; and scrape off pericementum, being very careful not to mar the delicate margins. Before dismissing the patient, pack cotton and Sandarac varnish in space and force the gum away as far as possible, winding up at a future sitting by using gutta percha to hold gum away from process and tooth while work is being done. I will say at this point that very frequently soft cementum will be found adherent to the piece and will prevent removing from the investment.

Second; Place piece of root, after cutting it off at the gum margin, in an investment material, flush to the top; if piece is large enough, drill hole and slip binding wire through so as to remove when investment is hard. It may also be coated with a little oil to facilitate removing.

Third; Fill with wax and attach sprue former, then invest as for a gold inlay. Be sure to use inlay plaster for the first investment.

Fourth; Place inlay on root and see if it fits correctly, if so place platinum pin in root which has already been drilled out, waxing it to inlay; it is now ready for investing, to solder the two parts.

Fifth; Place in mouth again, take measurement, as you would for a

Richmond crown, making a little band to fit around the root and inlay. After that is fitted, wax to inlay and solder together. A hole is punched in a small piece of plate gold and fitted over pin and band, and all soldered together.

Now the abutment is ready to proceed as for Richmond crown; take wax bite and impression, articulate, select your facing, grind to fit and wax up to the bite, then cast.

One caution is always to keep the gum well packed away until crown is cemented into position in order to keep dry so that the cement will adhere.

I have found this a very practical method for replacing fractured roots and have several crowns placed in the mouth which have been under my observation for years.

Porcelain Jacket Crowns, Gold Jacket Crowns, Porcelain Faced Jacket Crowns, Modified Richmond Crowns and Tungsten Pin Attachments.

George A. Thompson, D. D. S., Chicago, Ill.

A crown, a bridge, or attachment for a removable bridge or plate, with the minimum amount of devitalization and a total absence of irritation to the soft tissues.

I will briefly attempt to show how this may be accomplished and Nature's demand of it.

A filling or inlay—no matter what material is used should only be regarded as a successful operation when the cavity is properly prepared and the margins of the filling and tooth are perfect. Overhanging margins of fillings should not be permitted to pass the searching explorer. So well known is this fact that every patient we operate on is acquainted with it. When we realize that a filling or inlay involves but a small part of a tooth compared with a crown, are we justified in using a crown of any description which cannot be finished as we finish our fillings?

A careful examination of a large number of extracted teeth by competent men discloses the fact that the number of teeth which cannot be successfully treated is larger than we formerly believed.

The exact figures:

First Molars	13%
Second Molars	23%
Third Molars	54%

This percentage of failures will occur no matter how carefully the technique is carried out. Add to this the possibility of an accident (as a broken broach), and the further fact that a number of perfectly treated teeth give trouble and the percentage of failures goes higher and higher.

When we consider that this average is only possible to the man who makes a perfect root filling every time, and as many are far from perfect, how few treated teeth can give a good clean history say for ten to twenty years?

I now use an X-ray machine and follow out as carefully as I can the technique of Callahan. I fear that the men who do not use every aid we have at hand, may face some difficult problems a few years from now.

It is the commonly accepted fact that chronic suppurative pericementitis (pyorrhea alveolaris so-called) has its beginning in an inflammation of the gingiva.

With the above fact before us and with an understanding of the relation of blind abscesses to general systemic disturbances, are we justified in general devitalization of teeth or employing any means to supply lost parts, which will produce the slightest inflammation?

I will attempt to briefly describe the technique which I employ to construct the various crowns and attachments which I use.

For all teeth that demand a single crown, I prefer the porcelain jacket crown. It is the most beautiful restoration we can make. The color can be matched absolutely; it is less irritating to the pulp and as particles of food do not adhere to it, no other crown can compare with it from the standpoint of cleanliness. In addition to these advantages porcelain is better than gold for masticating purposes.

Porcelain Jacket Preparation.

Fig. 1. Represents the first cut which is made with a seven-eighths carborundum knife-edge disc, which is run under a constant stream of water.

Fig. 2. After the sliver of enamel is broken away from the tooth.

Fig. 3. A cut similar to the first.

Fig. 4. Both slivers of enamel broken from the tooth. At this point the enamel is ground from the labial, lingual and incisal surfaces using a gem stone under a stream of water. With a set of very fine enamel cleavers the tooth is entirely denuded of enamel.

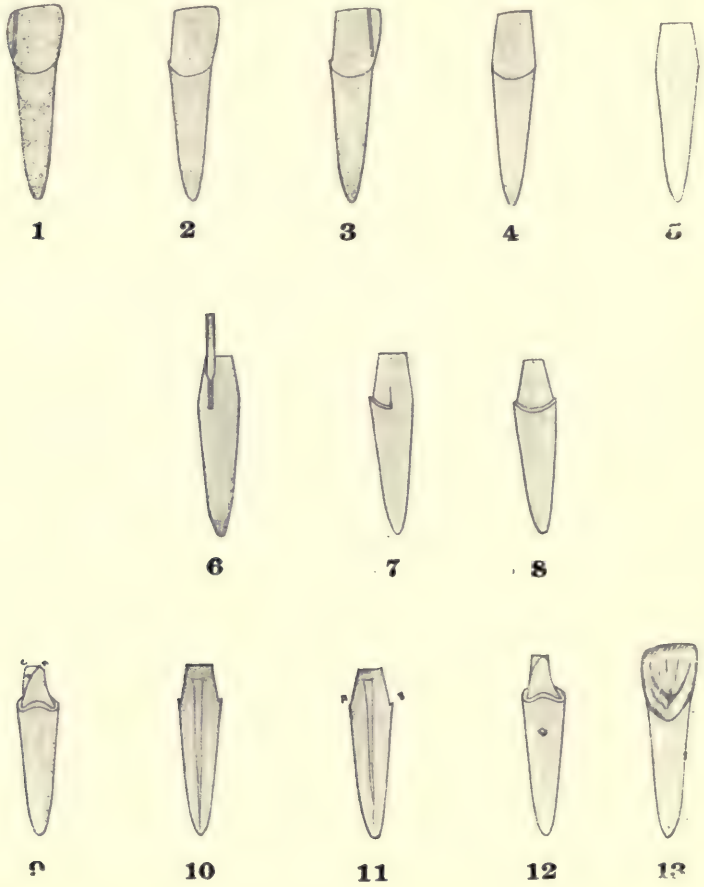
Fig. 5. Shows the tooth with the enamel entirely removed. I have an assortment of twenty-four sizes of seamless copper tubing, one of which is selected to accurately fit the root as if a gold shell crown were to be made. The band is trimmed to the curvature of the gum tissues at the gingival line. The band is then filled with Kerr modeling compound, oiled slightly on the surface and temporarily laid aside.

Fig. 6. The starting of the cut to secure the shoulder with a number fifty-eight S. S. W. plain fissure bur.

Fig. 7. The shoulder one-half cut.

Fig. 8. The shoulder as finished with a bur.

Fig. 9. A. The proper shape to give the incisal surface which should be parallel with the stress of mastication. B. Proper form for the



labial surface. If left as indicated in dotted line C the result will be a dark line showing through the finished crown.

Fig. 10. A cross-section of a prepared tooth to bring out a further refinement of the shoulder at the gingival. This is an important detail; the shoulder should incline inward and upward slightly toward the apex. This is accomplished with a special set of instruments, along the lines of enamel cleavers with the cutting-edge shaped similar to the gingival margin trimmers of Dr. Black; designed to be used with a pull motion.

Fig. 11. A. Shows the improper preparation of the shoulder. B shows correct form. This shoulder is always well under the free margin of the gums.

Fig. 12. Shows incorrect preparation at the labial and incisal, which should be changed to the dotted line.

The form given the occlusal surfaces of bicuspids and molars should be the only variation from the anterior technique. It must be prepared after the form Nature gives the dentin under the enamel cap, or in other words cusps should be developed in the crown or inlay restoration to overcome the lateral stress of mastication.

Fig. 13. Diagram of root and finished crown.

It is never advisable to use amalgam to build up a root. Use silver inlays for the best results.

Technique. The copper band is used to take the impression of the finished preparation; be sure that the band passes slightly above the shoulder. With some laboratory cement (Weston's), the tooth is reproduced in cement. The root is made quite large for convenience in handling. When the cement has set, heat gently over the Bunsen flame and remove copper band with compound. Trim the cement root roughly with a coarse grit stone at the lathe and finish it with sandpaper discs in the engine, having it smooth and conical toward the apex.

Build a white gutta-percha tooth over this cement root and lay it aside.

Take a mush bite in pink paraffin wax of the finished preparation and of the occluding teeth. Into this bite the cement root is placed in proper relation and the model is run up in plaster.

If the tooth prepared is a vital one the gutta-percha crown formed over the cement root is now cemented to the tooth. This will keep the fluids of the mouth from the tooth and it will not be sensitive; if not vital it can be made to adhere firmly enough with eucalyptol. In either case it will add to the comfort of the patient and keep the soft tissue away from the shoulder, which will be a disadvantage in setting the finished crown.

Formation of Matrix. The matrix is formed by cutting a piece of .001 gauge platinum foil about 1 mm. longer than circumference of the root at the gingival; it may converge toward the incisal, and should be about 3 mm. longer than the distance from the shoulder to the incisal. The cement root is removed from the model and the platinum is laid against the labial surface; it is roughly conformed here with the fingers, then

burnished to the shoulder with burnisher. Holding the platinum firmly to the root with the first finger of the left hand and the root with the second finger and thumb, a triangular piece is cut from the mesial and distal incisal angles; this permits the central portion to be burnished over the incisal and down onto the lingual about 1 mm.

The burnishing continued around the mesial and distal surfaces conforms the platinum accurately to the shoulder as well as to the surfaces. This will bring the ends well around the lingual. With a pair of pliers the ends are grasped and brought together, the excess projecting at right angles from the surface. Trim away all but 1 mm. then with cotton floss turn over one-half of the foil to make a lap, following this up with another lap, and we have what is known as the double lap or the tinner's joint. Remove, trim all but about 1 mm. beyond the shoulder toward apex. Reburnish the entire matrix accurately and you will have a matrix which will be a positive fit and will stand all the handling that is necessary.

Technique of Porcelain.

The model is painted with banana oil to prevent the plaster from absorbing the moisture from the porcelain. The porcelain which I use is S. S. W. 2560°. The first color, the gingival, is put on with the cement root in the hand, packing the porcelain to the greatest density, building up to or beyond the incisal as the case may be. Place the root in the model and lay on the second color bringing the porcelain out to full tooth contour, and occlusion; remove and add what is needed to the contacts. Then the porcelain is ready for the furnace. If the proper density is given the porcelain the crown can be finished with one bake; if not, more porcelain can be added wherever it is needed.

Many shades cannot be reproduced with two colors; at times three or a combination of four or five colors give the best results.

After the crown is baked, strip it of the platinum and set with a special cement, maintaining pressure for three or four minutes.

Porcelain Faced Gold Jacket Crowns.

We are at times called upon to construct bridges, for patients well advanced in years, with teeth badly worn by abrasion. If you attempt to devitalize the tooth, considerable difficulty may be had in locating or removing the pulp. For such cases I use a porcelain faced gold jacket crown. The root preparation is the same as for the porcelain jacket crown, except possibly more dentin is removed from the labial. Secure the cement root and run up the models. Burnish the platinum to the root and solder a long pin facing to it.

Gold Jacket Crown.

The preparation varies in that the shoulder can be made less definite and need not be inclined inward and toward the apex of the tooth. Secure the cement root and models as for a porcelain crown. The platinum-foil is made in the form of a ribbon about 3 mm. in width folded as a tinner's lap-joint; it is not necessary to pass toward

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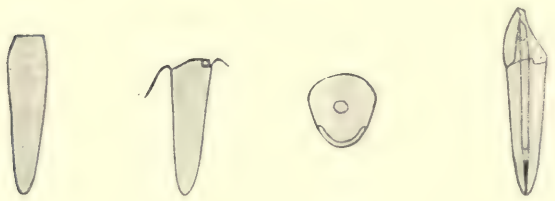

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the occlusal more than 1 mm. Oil the cement root and platinum ribbon, over which form and carve crown in Taggart's wax to full contour and occlusion. Remove the wax, but leave the platinum on the root. With a Brophy suction instrument remove all surplus wax on the inside of the wax crown; invest and cast.

When the cast-gold crown is adjusted to the platinum ribbon on the cement root, imperfections will be found at the gingival.

Wax the platinum and gold-casting together, with sticky wax, invest in "Sump" and solder with 20 K. gold solder. The result will be a margin at the gingival that will rival any foil-filling or inlay.

Modified Richmond Crown.

The first preparation is made as for a shell crown; fit a copper band to the root and trim to the gingival contour of the gums. (Fig. 19.) Face the root down as far as for a Richmond crown under the free margin of the gums on the labial. (Fig. 20.) On the lingual

a step is cut under the free margin of the gums with a plain fissure bur. it should be about 1 mm. in depth and running slightly around to the mesial and distal angles. This will give a crescent shape which will prevent the finished crown from rotating on the pin and will resist lingual stress better than a Richmond; in addition it can be finished flush with the root as if it were an inlay.

I use seventeen gauge Tungsten wire which I believe is better than iridio-platinum. The pin is now placed in the root canal and an impression of the face end of the root and shoulder secured. A copper matrix is placed around the band with the impression and copper amalgam is heated and packed around the pin and the face end of the root reproduced in copper amalgam. About twenty-four hours after, this amalgam is hard enough to swedge a piece of thirty-six gauge pure gold against it. Trim the surplus gold away, secure the relation of the swedged piece of gold and pin with Kerr compound; remove the fold and impression, break the amalgam root and secure the Tungsten pin; place in proper relation in impression, invest and tack the pin and gold with a small piece of 22 K. solder. Place same in the mouth and accurately burnish, using Thompson or some similar burnishers. Take another impression in the mouth with Kerr compound, invest and strengthen the entire piece of pure gold with 20 K. solder. Replace in the mouth, secure a mush bite and finish as you would a Richmond crown. This crown can be made so accurately that no gold need show on the labial.

Tungsten Pin Attachment.

The Tungsten pin attachment is used for attachment of any character which is usually soldered to a crown, or can be used to carry a facing, or as an abutment for a bridge. Generally used on the central, lateral or cuspids.

On a vital central the first cut is made with a fine gem stone (under a constant stream of water), cutting away the lingual enamel plate from the incisal to the center of the linguo-gingival ridge. Fig. 14, dotted line. If the swing in a bridge is to run from the distal, the distal enamel surface is ground away to dento-enamel junction leaving a shoulder at the gingival slightly under the free margin of the gums. Fig. 15. On the lingual the preparation should never pass the mesio-lingual angle.

With a plain fissure bur a shoulder is cut running from mesial to distal in the center of the linguo-gingival ridge, about 1 mm. into the dentin. Fig. 16 A. Another shoulder is cut parallel with this about 1½ mm. from the incisal, also about 1 mm. in the dentin. Fig. 16 B. (In preparing a cuspid the second step would take the form of the enamel cusp as the horn of the pulp might otherwise be exposed.)

Secure an accurate impression of the lingual and distal surface, with a copper band filled with Kerr compound. Pack with copper amalgam and later swedge a piece of pure gold thirty-six gauge to accurately conform to the lingual and distal surfaces. This is placed in the mouth and accurately burnished to the preparation as in Fig. 4.

After the pure gold is burnished, three holes are cut in the dentin (as shown in Figs. 17 and 18), about 2 mm. deep to accomodate a number twenty, Tungsten pin. These holes must be parallel, which is not as difficult as you may imagine. Place the pure gold in position, punch holes in it with the explorer to receive the pins, take a Kerr compound impression, remove, invest band, tack pins to the pure gold with 22 K. solder. Replace this in the mouth, carefully reburnish, and remove as before with Kerr compound; invest and strengthen all over with 20 K. solder.

This attachment is one which I think much of. I have used it in over a hundred cases and have lost but one pulp. That was in my first preparation. After studying carefully my dental anatomy and varying my preparation slightly, I believe I have sailed free of trouble since.

A modification of the same principle with inlays I frequently use in molars successfully. A preparation of this kind can be used but on one end, unless a slot and pin are used on the other or a crown is used.

Prosthodontia.

A Collection of Models, Abnormal, Peculiar and Difficult.

By Dr. L. P. Haskell, Chicago, Ill.

Dr. Haskell showed those interested his collection of models, and gave an interesting talk daily on denture making, based on his seventy years of experience. These reminiscent talks proved very interesting, especially to the younger members of the profession.

Dr. Haskell's contention is that metal plates can be made for all cases as easily as vulcanite.

Dr. Haskell's description of some of his models was as follows:

Model of an upper jaw, very flat hard palate, necrosed bone removed on right side, left side flexible ridge; plate worn for thirty-two years.

Case of flat jaw but soft arch. A successful denture was made without vacuum chamber or relief.

Case of hard growth in the palate, covered with relief. Satisfactory plates were worn for years.

Two interesting models were shown of the same jaw; models were made twenty years apart; a continuous gum denture was worn during this time and the jaws showed but little change.

A model showing no absorption after twenty-seven years which Dr. Talbot claims was due to "hyperthrophy of the alveolar process." This case required a continuous gum case as patient showed gums.

A case of a very high narrow arch, for which a gold plate was successfully made.

Several flat ridgeless jaws on which continuous gum cases were made and worn for many years, showing that weight does not interfere nor is an air chamber necessary for retention.

A model of Gen. Sheridan's lower jaw, anterior teeth and one molar remaining. For twelve years Gen. Sheridan had been unable to get a satisfactory denture. A gold plate with clasps on cuspids was made, which was worn with great satisfaction.

Several models of flat lower jaws, the problem of the dentist, solved by twelve years' experience in my own mouth.

A Sure Retention of the Upper Denture.
By James Wilson Cormany, Mount Carroll, Ill.

This clinic consisted of an impression with plaster of Paris taken in usual way; then remove enough of impression in center to cause relief chamber; then run the models; when plaster is sufficiently hard, cut groove across heel of model about one-fourth inch from extreme heel of model; then bevel model at the heel to cause plate to press up well against the soft palate.

Cast Materials and Their Manipulation.
By Dayton Dunbar Campbell, Kansas City, Mo.

The four essential elements in the successful construction of an artificial denture are the impression, the cast, the articulation, esthetics and contour. No one of these is of greater importance than that of cast making. If an impression be filled with a poor cast material, such as plaster of Paris, inclosing the flask prior to the vulcanization process, the plaster cast will be so compressed as to warp or distort the vulcanized base.

Use of Spence Compound.

There are several materials on the market for making casts. The oldest and the best is the Spence Plaster Compound, manufactured by Dr. Stewart J. Spence, Chattanooga, Tenn., and may be obtained at any dental supply house.

Many dentists have tried this material and have discarded it because they did not know how to properly mix it. One measure of water to two of plaster constitutes the usual mix of plaster. With the Spence compound you are enabled to use one measure of water and incorporate from three, three and a half and even four measures of the Spence plaster compound; the more dense the mixture the better the cast will withstand compression; also it consumes less time in setting.

The Spence plaster compound should be mixed in the largest size rubber bowl and a glazier's putty knife with the corners rounded off should be employed instead of the regular spatula. After mixing a while it is well to knead the compound by rolling the bowl containing the compound upon the bench, using quite a bit of pressure.

Take a small quantity of the mix and place in the center of the impression that has been previously coated with some separating material (the writer uses soap) working it down into every portion of the impression, and in this way avoid air bubbles.

If upon separating, the cast contains a number of holes they may

be filled up with a thin mix of plaster and the finished base will come out free from modules.

The Weinstein Cast Material.

This material may be secured from C. A. Neilson Co., of New York City. It is a finer grained impression material than the Spence compound, and while it requires from three to four hours to set, it is especially useful in the pouring of impressions in the construction of partial vulcanized dentures.

Unlike the Spence compound, it may be vulcanized upon directly without the use of tin foil.

Sorel Cement, Prothero's Compound, "Magnesite."

This material was first exploited in the dental profession by Dr. James H. Prothero of Chicago, Ill. The greatest difficulty with this material is that it is so hard to obtain. In the larger cities the flooring companies have it in abundance and it may be obtained at ten cents per pound for either the chloride or the oxide of magnesia. For instance, in San Francisco, the firm of Mallott & Peterson in the Monadnock Building, will supply it.

A supersaturated solution is made of the chloride of magnesia. To seven parts of the supersaturated solution is added one part or twelve and one-half per cent. solution of sulphate of magnesia (epsom salts). The sulphate of magnesia must also be a supersaturated solution.

The dry oxide of magnesia is mixed with the chloride of magnesia and twenty-five per cent. of Del Monte or glass grinder's sand added until the mixture is thick and sticky. It is now ready to be poured into the impression that has been previously coated with Sandrac varnish. This material hardens in from four to six hours when it may be used to swedge gold plates upon or correct aluminum castings.

The cast should be trimmed to the desired size within three hours from the time it is poured, otherwise it will be impossible to cut it.

Resumé:

Commercial oxide of magnesia, powdered form, keep dry.

Commercial chloride of magnesia, saturated solution to which has been added one-eighth part supersaturated solution of sulphate of magnesia, or what is generally known as epsom salts.

To mix, take out the desired amount of liquid and mix with the oxide of magnesia, adding twenty-five per cent. glass grinder's sand.

The Hall Articular.

By Dr. Rupert E. Hall, Chicago, Ill.

In an articulator we must remember that we need to reproduce only the movements necessary to mastication—movements when the planes of two or more teeth are in contact; movements when the condyles are articulated in the fossæ and not on the incline of the *eminentia articularis,* as embodied in articulators of the past and present.

My articulator affords the means for reproducing mechanically all the masticatory movements and their combinations. The oscillatory lateral movement (Bennett) to which the others are subordinated, whose center in Nature is the external occipital protuberance, is taken as the starting point, and its reproduction mechanically forms the foundation of the appliance. The other movements—opening and closing and incising—are reproduced by mechanisms so attached to the oscillatory device that while each is independent, all work in harmony. The centers are all variable, constantly shifting under the motion of the articulator, and are capable of an infinite number of combinations and modifications that provide automatically the movements necessary to the mastication of food as in Nature.

My work is based on an extension of Bonwill's discovery that the ground plan of the human mandible is an equilateral triangle bounded by lines connecting the centers of the condyles, and these again with the median line at the incisors. It is certain that the triangle as projected by Bonwill is not all of the secret; that while the condyles are undoubtedly an active factor in what we may call "eccentric movements," and to a certain extent their guide, the movements are governed from elsewhere.

If we conceive the Bonwill triangle folded back on its base as a hinge, the apex will take its position in the region of the external occipital protuberance. The two positions of the triangle will not be in the same plane; the dihedral angle will be the same as the dihedral angle between the lateral faces of two regular triangular pyramids placed base to base, forming a double pyramid.

In the articular the external occipital protuberance is taken as the apex of a cone, one of whose elements is the line to the apex of the Bonwill triangle, which line determines the occlusal plane and upon it is located the opening and closing center. The generating angle of the cone is determined by the angles of the cusps of the teeth to the occlusal plane. As a forty-five degree angle will produce cusps of the highest efficiency in mastication and is found to be the predominating angle (first bicuspid) in natural teeth, it has been chosen for the cone.

If you bisect a cone transversely in any direction except vertically

through its apex or parallel to its base, you will form an ellipse, a line on the periphery of which, from one point to another will be elliptical. This is precisely the form of the path of the mandible in its forward and lateral masticatory excursions—elliptical, transversally upon and about the surface of a cone, and not circular, as believed in the past.

These two combined movements—lateral and forward—form the gothic arch of Gysi, described by the apex of the Bonwill triangle in mastication. Note that the forward movement in the combination is the incisive movement coming from the combination of the incisive and the opening centers in the vertical plane directly below the condyle on and below the occlusal plane. For a better conception of the gothic arch of Gysi, move the mandible, carrying the teeth into the incisive position, and as the mandible advances swing it to the side, combining the two movements describing the gothic arch.

As noted by many observers, the Bonwill triangle varies in most cases from the true equilateral form, though seldom to any great extent. In practice the variations can be ignored, and the triangle can be treated as though it were a true equilateral; that is, with the line measuring its altitude exactly bisecting its base, which is the line connecting the centers of the condyles. The altitudinal line of the Bonwill triangle is the median line of the face in the sagittal plane of the skull. In this plane, at the same distance back of the base line as the apex is in front, and at the same angle to the occlusal plane, we find the external occipital protuberance, the rotation center of the mandibular lateral movement (of Bennett). The Snow face-bow will give us most accurately this measurement and the exact characteristics of the Bonwill triangle. These measurements transferred to the articulator furnish the basis for the mandibular movements of the given case.

The Perfect Plaster Impression.
By Dr. Rupert E. Hall, Chicago, Ill.

The method of taking impressions here described is offered as a solution of the problem which has heretofore been the bane of plate workers. A perfect impression is universally recognized as a necessary essential to a perfectly fitting plate.

Plaster of Paris has the characteristics which promise the best results. The method of using it which I submit points the way to the realization of those promises.

The Individual Tray.

The first, or basal essential in the taking of a perfect impression is a tray suited to the case; in other words, a tray that fits. You see this in the changes the prosthodontist makes in his metal trays

—blending and cutting them to secure better adaptation. From the very nature of the work a special tray is necessary to get perfect results.

The S. S. White Impression Tray Compound was devised for the particular purpose of making these individual trays quickly and economically. It is somewhat of the nature of a modelling composition, but with

Fig. 1. Britannia-metal tray filled with S. S. White Impression-Tray Compound ready for insertion in the mouth.

differences that adapt it specially to the making of trays. It is jet black in color to make it readily distinguishable; has a high melting point to assure when set or hardened ample rigidity to be self-supporting, and to be unyielding when trimmed to a thin edge; and is readily cut as may be desirable in shaping it.

The Impression Material.

The second essential to the making of a perfect impression is a material of a consistence that will yield to the delicate soft tissues of the mouth when it is applied, without offering the slightest resistance; and then set or harden quickly into a rigid non-elastic mass bearing the perfect impress of every detail of the surface with which it has been brought into contact. Plaster mixed thin—so thin that it flows—is the ideal material for taking impressions. The superiority of plaster as an impression material has always been recognized. The following method

shows the way to utilize it to get the ideal results that have been the aim and the despair of prosthodontists from time immemorial.

Making a Tray. It is necessary in employing the S. S. White Impression Tray Compound to have a few regular metal trays of suitable forms and sizes. Take

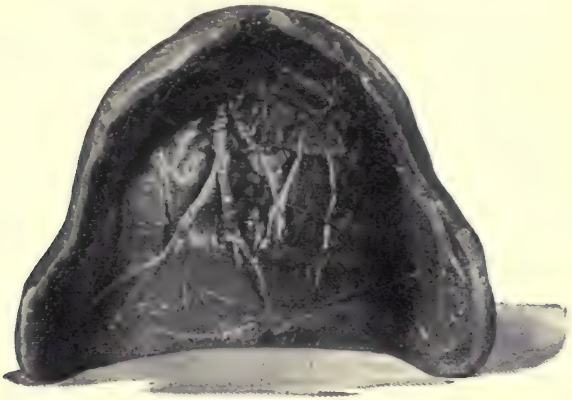


Fig. 2. Lingual view of trimmed individual tray made from Impression Tray Compound.

Fig. 3. Palatal view of individual tray (Fig. 2) after trimming and scoring.

a metal tray of the proper shape for the case, but somewhat larger than you would ordinarily use. Fill it with the compound, softening in hot water; a higher heat will be required than in softening ordinary modelling composition (Fig. 1). Pass it over a Bunsen or alcohol flame to soften and remove inequalities in the surface and give it a glaze. Plunge quickly into hot water to wet the surface and prevent adhering to the tissues, and as soon as it cools to a bearable degree insert in the mouth and secure an impression in the regular way. In a short time it

can be removed from the mouth and placed in cold water to harden.

Remove the impression from the metal tray, trim away the compound until you have a thin tray form with the margins about one-eighth inch shorter than the finished outline of the plaster impression is to be (Fig. 2). To make sure that there shall be no impingement of the tray form

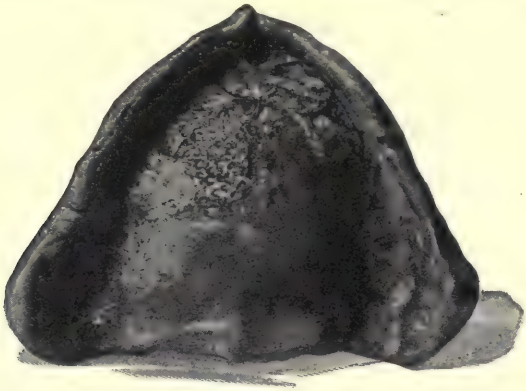


Fig. 4. First trial plaster impression. Note imperfections that make second applications of plaster necessary.

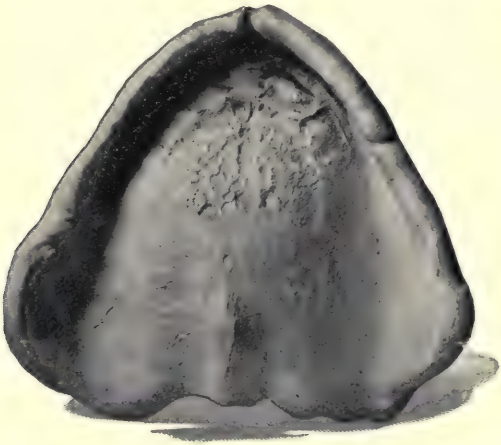


Fig. 5. Second trial, producing a perfect plaster impression, bringing out every detail of the palatal surface and peripheral margin with normal muscle action.

against the soft tissues, and to allow the plaster for the impression plenty of room to escape freely instead of being forced against the tissues, the inner surface of the periphery should be trimmed to a rather sharp edge. Make sure that you do not trim it too much, as otherwise the plaster when applied in the tray form may not be carried to place; or if it is it will break off because of the long overhang. If you should happen

to trim the form too short, the difficulty can be remedied by fusing more of the compound to the form wherever desired, inserting in the mouth while soft, and allowing the tissues of the mouth to properly form the tray outline, which can then be cut down a little to allow for the plaster Finally score the palatal surface to give the plaster a hold (Fig. 3).

You now have a tray that perfectly conforms to and fits the individual case, with no bulky projections nor protruding edges to impinge upon and distort the soft tissues or push them from their normal positions.

Getting the Perfect Impression.

Have the patient sit erect in a normal position. This closes the fauces and prevents the plaster from passing down the patient's throat. Mix clean, fine, quick-setting impression plaster so thin that the compound tray when dropped into it (which is the next step) will sink. The plaster should be sifted thoroughly at the time it is used, to be sure that it is freed from any lumps caused by dehydration as commonly found in plaster. The idea in mixing the plaster to this consistency is to make sure that when placed in the mouth it shall be thin enough to flow readily around and over the soft tissues without disturbing them. Lift out the tray, allow all excess to flow off, insert in the mouth with a rocking motion, and have the patient close the mouth and drop the lips to their normal rest position. Wait a few minutes for the plaster to set before withdrawing (Fig. 4). In rare cases this first impression is all that is required. Usually parts of the tray form will remain uncovered by the plaster, showing compression of the tissues from imperfections in the shape of the tray form or because it is too long. Trim all such places away, and make a second trial as described below. Sometimes a third, and rarely, through faulty technique, a fourth trial may have to be made. Whenever the impression fails to be satisfactory, trim away all excess of plaster, thinning down the peripheral edge to provide space or vent to facilitate escape of the plaster and thus avoid the stress that would cause the displacement of the soft tissues. Make a new mix of the plaster—very thin—add a little salt to hasten the setting, drop the trimmed tray and impression in the mix and proceed as before. As often as imperfections appear, trim and try again. The method properly carried out will produce a perfect impression, from which a plate can be made, which, because of its accurate adaptation, dispenses with the need for air chambers, suction devices, and the like (Fig. 5).

Lower Impression.

In taking lower impression, after the tray carrying the plaster has been inserted, have the patient raise the tongue as high as may be, point-

ing it forward; then after the tray is adjusted, drop the tongue to place. This procedure allows the thin plaster to run into every space, extending under the tongue around the edge. Do not trim this off, but preserve it sedulously, remembering that wherever the plaster runs rubber may be substituted, because it can be depended upon that plaster used as here

Fig. 6. Dipper sieve for sifting plaster. It is used by holding it over the plaster bowl, and tapping the rim with the spatula, which assures the plaster reaching the water in a finely divided condition, free from lumps and débris.

described—very thin—will not compress or displace the tissues. The flanges so provided (by extending under the tongue) give the plate a larger bearing surface, assure the help of the tongue in holding it in place and diminish the opportunities for food to get under the denture.

Adjustment of Impressions.

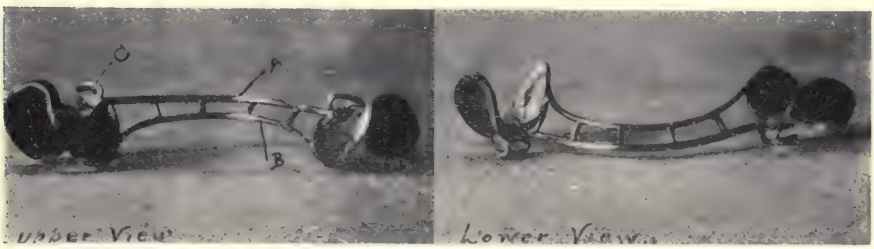
After the impressions are made, try the upper in the mouth and test for fit; put pressure upon one side and the other as would be exerted in masticating upon the finished denture. If it rocks, you have evidence of a hard area or areas in the palate. Remove the impression, locate the hard areas, outline them upon the palatal side, cut away the plaster at the places indicated until you have relieved all pressure or contact between it and the hard areas of the palate, and until you can no longer rock and dislodge the impression. Sometimes hard areas will be found which are not extensive enough to noticeably affect the fit. They should always be outlined upon the impression and should be relieved, as after the denture is worn for a time it will settle and may ultimately be brought to bear upon the hard areas, developing rocking.

The work is done under normal temperature—there is no distortion through engorgement of the tissues by a high heat. The plaster because of its thinness flows naturally into undercuts and spaces, assuring a perfect reproduction of all parts—soft and hard in repose, and all surplus escapes.

The bite may be secured with the perfected impressions in the same manner as with "correctible" compound impressions, should this method of securing the bite be desirable.

Cruss-type Lingual Bar Lower Denture.
By Herbert J. Samuels, Oakland, Cal.

Instead of the usual heavy round or oval wire lingual bar or swaged plate, there is made a truss consisting of an upper (A), and lower (B)



Truss-Type Lingual Bar (Samuels)

span of stiffened iridio-platinum or platinum-gold wire, connected by vertical bars or rods, with solder, placed in the position most convenient to obtain the desired result.

The theory of a truss-span as used in bridges is the basis of this idea.

The lower span wire may be sixteen- or eighteen-gauge wire, round, and the upper may be the same gauge or thinner, as the case indicates. The lower span is shaped and fitted first and soldered to the lower border of the saddles. The upper is then shaped and fitted and soldered to the upper surfaces of the ridge of the saddles. The vertical rods are then fitted and soldered. There may be as few or as many as the length of the span will require, and so placed as to best fit the conditions of the lingual aspect of the remaining anterior teeth.

Wire loop clasps (C) are used with this denture.

The points of superiority of the truss-type lingual bar are: adaptability, strength, rigidity, lightness, cleanliness, beauty and symmetry.

Analgesia and Anesthesia.

Hot Water Obtunder.
By Dr. A. F. Merriman, Jr., Oakland, Cal.

Dr. Merriman demonstrated an original method, his Hot Water Dental Obtunder, in the preparation of a large cervical cavity, lower first bicuspid; also in the preparation of a large cervical cavity, lower cuspid.

The cavities were examined and tested with both the excavator and dental engine, by several operators present, and found highly sensitive,

The clinician then used the obtunder, and the cavities were prepared without any pain or discomfort.

The heating device consists of an improved means for applying constantly to the part operated upon, simultaneously with the operation of drilling or grinding, a jet of hot water, under suitable pressure and maintained at the required temperature during the operation. The stream of water, is under perfect control of the index finger of the right hand of the operator, and the water is drawn constantly from the mouth by a good saliva ejector.

It was explained that the phenomenon of the relief of pain and discomfort is due to a combination of four simultaneous causes:

1st. Avoidance of shock brought about by the water forming a cushion between the revolving bur or stone and the tooth.

2nd. The prevention of the regrinding of the débris, allowing the bur to cut clean, and faster.

3rd. Dry heat, usually caused by friction, is prevented.

4th. The relaxing influence of the hot water upon a (healthy) pulp, causing failure to respond quickly, has a paralyzing effect on sensation.

Use of Hot Water as an Obtunder in Treatment of Pyorrhea.
By Dr. W. J. Younger, Paris, France.
Assisted by A. F. Merriman Jr., Oakland, Cal.

The joint clinic was a demonstration of the value of the use of hot water in preventing pain and discomfort in the treatment of pyorrhea and scaling sensitive teeth.

Dr. Younger operated upon the six anterior teeth for a fellow member of the Congress, while Dr. Merriman applied a steady stream of hot water. The teeth were very sensitive in scaling unless the hot water was constantly applied. The patient expressed himself as highly pleased, and said the operation was without pain. Dr. Younger employed his usual treatment in pyorrhea, thorough scaling and the use of concentrated lactic acid as final medication.

Peridental Anesthesia.
By Dr. Frank L. Platt.

This clinic demonstrated a method of injecting a local anesthetic into the cancellous tissue of the alveolar process, as fully described in the paper entitled *"Peridental Anesthesia,"* published in the proceedings of the Congress.

The first case presented was an upper left cuspid, with partially devitalized pulp. The tissues surrounding the tooth having been as well sterilized as possible, a small quantity of the anesthetic was injected into the gum, well up under the lip and distally to the root of the tooth. The outer plate of the process was then perforated with a number one-half round bur, and the anesthetic was then injected through this perforation into the cancellous tissue surrounding the root by means of a conical needle, with which the ordinary hypodermic needle had been replaced, its conical shape causing it to bind in the opening made by the bur thus preventing the leakage of the anesthetic. Ten or twelve drops were injected, when it was found possible to remove the vital portion of the pulp without pain.

The second case presented was an upper right first bicuspid with disto-occlusal cavity, pulp nearly exposed and extremely sensitive.

The gum having been sterilized and the syringe fitted with the regular style of hypodermic needle used in this method of anesthetic procedure, viz., a twenty-eight gauge needle projecting three millimeters beyond the reinforcement, the needle was inserted into the inter-dental papilla between the first and second bicuspids, and high enough to insure reaching the inter-dental septum about one-sixteenth of an inch above its apex.

Injection was commenced as soon as the needle touched the gum, as it is essential in order to do painless work to keep the anesthetic always ahead of the needle, and as soon as the bone was reached the needle was driven through the outer plate of the process by repeated light blows on the head of the piston of the syringe, stopping between blows to inject more of the anesthetic if possible. The process in this case was easily

penetrated when ten or fifteen drops of the anesthetic was slowly injected into the process. The pulp was removed painlessly and the cavity prepared and filled temporarily.

The paper above referred to will be found to give in detail the method to be employed in any case where intraosseous anesthesia is indicated.

Local Anesthesia, Infiltrative, Conductive and Intraosseous Methods.
By George N. Hein, San Francisco, Cal.

Anesthetic used, two per cent. novocain, 1/30000 Suprarenin.

Case 1. Patient, young woman aged twenty; operation, preparation of upper left bicuspid for jacket crown.

The field of operation being cleansed by means of the atomizer and thoroughly bathed with a seventy per cent. solution of alcohol, cotton rolls are so placed as to protect it from the saliva and a pin point application of phenol is made between the molar and bicuspid to render the puncture with the needle painless.

A few drops of the anesthetic solution was then injected into the inter-dental flap by means of a peridental syringe mounted with a one-quarter inch No. 28 gauge needle directed toward the bucco-apical region of the tooth to be anesthetized. This needle was then replaced with a conical needle having a point about the size of a number one-half rose head bur and the syringe placed in a convenient position for future use.

The lips, cheek and membrane were then held under tension and an incision one-sixteenth of an inch long made with a lancet through the gum between the upper thirds of the roots of the molar and bicuspid.

With a number one-half round bur in the engine handpiece the outer plate of bone was punctured where previously exposed by the incision, the entrance into the cancellous tissue being denoted by a sensation similar to that felt when opening into the pulp chamber. The conical needle was then inserted into the opening made by the bur and twenty minims of the anesthetic injected, three minutes being consumed in the operation to avoid undue stimulation, as in this method direct venal injections are made. The tooth was then painlessly prepared for the crown in the usual manner; time consumed one hour and fifteen minutes.

Case 2. Patient, man, aged forty-five; operation, extraction of ten upper anterior teeth, five being vital.

The region to be operated upon was prepared as in the previous case and the syringe fitted with the one-quarter inch No. 28 gauge needle. Four intraosseous injections were made by gently tapping the needle

through the outer plate of bone into the cancellous tissue between the bicuspids, and the cuspids and laterals on each side, the puncture being made through the inter-dental flaps slightly above the gingival border of the teeth. Five minutes were consumed in making the injections during which sixty minims of the anesthetic were administered. The pulps of the five vital teeth were then entered with a bur to prove their complete anesthesia. The teeth were then extracted without pain.

Case 3. Patient, man aged thirty-five; operation extraction of upper right third molar.

The region to be operated upon was prepared as in the previous case and the needle tapped through the outer plate of bone into the cancellous tissue, the puncture being made through the inter-dental papilla between the second and third molars. Anesthesia was obtained and the tooth extracted in four minutes without discomfort to the patient.

Case 4. Patient, man aged thirty; operation, extraction of impacted lower third molar.

Preparation made as in previous cases and conductive anesthesia employed by making the pterigo-mandibular injection.

Twenty-five minims of the anesthetic were injected in the region of the mandibular foramen and as results by this method are not obtained within fifteen or twenty minutes mucous anesthesia was also employed. an injection being made on each side of the tooth to be extracted. By this means the operator was enabled to commence operations on the overlying soft tissues and also remove whatever osseous tissue may have overlain the tooth. The operation was commenced immediately and the tooth removed.

The operation consumed one hour and twenty minutes during which there was complete anesthesia.

The Use of Novocain in Oral Surgery.
By Dr. Josef Novitzky, San Francisco, Cal.

Removing an impacted lower third molar. The tooth was lying horizontally in the ascending ramus.

Part of the external oblique line was removed; also cusps of impacted tooth, where it infringed on the distal aspect of the second molar. The impacted tooth was rolled out of its bed buccally.

It is safer to work from the buccal side in these cases, and avoid injury to nerves, which could well follow, when operating from the lingual side.

In some cases the parotid gland must be taken into consideration,

especially where it comes in contact with the anterior external margin of the ascending ramus. The gland in some cases extends low down on the external oblique line of the mandible.

Salivary fistula, infection, hemorrhage, or nerve injury would be apt to follow in a certain percentage of these cases, particularly where the operative interference has not been carefully planned.

The anesthetic used was a 0.2 per cent. balanced novocain solution. By balanced I mean, it was isotonic. It was equal in osmotic pressure to a nine-tenths per cent. (0.9) salt solution. Figuring two grains of novocain to be four-tenths per cent. (0.4) osmotic pressure, when added to one hundred minims of water and one-half grain of salt, to be five-tenths per cent. (0.5) , when added to this same one hundred minims of water, the novocain and salt together, would give us nine-tenths per cent (0.9) or normal pressure. The use of a balanced solution, and an appropriate technique, will prevent any post-operative swelling or injury that could be attributed to the injection, and if the retracting is carefully and completely taken care of without mauling and bruising the soft parts, opportunities for post-operative discomfort and complications should be reduced to a minimum.

Three c.c. of 0.2 per cent. novocain with two minims of suprarenin was injected at the inferior dental foramen. Anesthesia was obtained in six minutes. Five minims of solution was injected under the buccinator muscle to block off the buccal nerve.

The second case was a root amputation of the right upper central root. The radiograph indicated considerable thickening in the alveolus.

Novocain infiltration was used in conjunction with a ten per cent. solution of cocain in the nostril. Anesthesia of the naso-palatine by way of the nasal membrane is very easily produced.

Oral Surgery.

First Aid Appliances for Fractured Jaws.

By Lieut. Robert Todd Oliver, Dental Corps, U. S. Army.

Chair Clinic. Demonstrating the utility of the author's Fracture Trays, and methods of their employment.

Description. The fracture tray is a modified form of double impression tray, similar in appearance to two flat lower impression trays fastened together, back to back. It has a very short handle, and an upper and lower half. The floor or partition between the halves being as thin as possible (consistent with strength), has a narrow slotted opening on either side. They are of three sizes, approximating average widths and sizes of jaws.

Technique. Each half of tray is filled flush with properly softened modeling compound ("Perfection"), care being taken to have compound forced together and joined through both slots for retention purposes. It is then inserted into the mouth, carefully pressed up or down, as the case may be, upon the teeth of the uninjured jaw. Then the teeth of the fractured jaw, previously remoulded to normal alignment and articular plane, *and held thus,* are inserted into the other half by the complete closure of the jaws. The compound is chilled and the whole appliance carefully removed. All excess compound is cut away, all margins rounded to prevent fracture of frail edges and the possible irritation of soft tissues by sharp angles, and all tooth moulds slightly enlarged with a sharp knife to facilitate reinsertion. The impression is again chilled, cleansed with an antiseptic wash and reinserted. Care should be taken to observe that each tooth goes full length into its proper receptacle and that the jaws are kept closed, with appliance in position, by a properly adjusted occipito-mental pressure. This may readily be accomplished by the application of a simple four-tailed bandage. Before starting the bandage, a piece of rubber-dam, oiled silk or oiled muslin, about five inches square, is laid over the nose and mouth with lower border extending about one inch below margin of lower lip. Start the bandage so that it will cover this square up to the border of lip, thus holding it firmly; and when the bandaging is finished, turn the square down over

chin like a bib for protection of the bandage against soiling from "drueling" or during feeding operations.

Theory. Many cases of fractured jaws occur at times or under conditions where it is either impracticable or impossible then to render the proper surgical attention. And yet it is necessary to do something more than prescribe a mouth wash and "tie up the jaws." By this method the patient is rendered comfortable by having the parts readjusted and held firmly in place and at the same time is given mental relief by substantial proof that something tangible and effective has been done. Owing to the facility with which antiseptic mouth washes and liquid food may be administered through a tube, and sucked back through the "Post Dental Aperture" (Oliver) the patient may, if necessity requires, get along fairly well for a period of several days before the final surgical procedure is contemplated. It is well, however, to carefully remove the appliance for cleansing purposes and renewal of bandages every two days. In case of much hemorrhage from fractures compounded internally, such hemorrhage should be controlled before the initial insertion.

Brief Outline of Technique for Root Amputation.
By Dr. Richmond C. Lane, Los Angeles, Cal.

Not only instruments, but the operator's bracket handpiece should be thoroughly sterilized before operating. The oral mucosa which is always infected, must be thoroughly sterilized. Iodin occupies the predominate place among medicinal agents. Benzine is also used, and a combination of iodin and aconite. These reagents are indispensable and are destructive to superficial bacteria. They also produce dryness of mucosa, tanning of the skin, fixing the bacteria for some time in such a way that they are quite dormant, if not destroyed. The iodin besides these properties, retards bacterial growth, by clinging for a long time to the tissue to which it has been applied, as low as 1 to 8,000 has been know to retard the bacterial development. Not only should the iodin be applied, but it should be repeatedly rubbed back and forth, mechanically cleansing the surface.

As the injection generally precedes surgical intervention it plays a part in the subsequent healing of the wound. For this reason even in a very minute operation, full attention should be given to asepsis as untoward sequelæ may arise from neglect of one of the factors involved. Many cases of edema following injection are attributed to insufficient asepsis, such as; neglect in sterilization of the hands, instruments, and other things really brought in contact with field of operation.

Radiography is indispensable in root amputation, not only as a guide, but it establishes the extent of the osteomyelitis.

Local anesthetics most often used, should be boiled, making the solution sterile.

Operation. One-half to three-quarter inch, transverse incision made approximately two millimeters from apex, or toward crown of tooth, or better, incision should be made in the middle of field of operation. At times it is necessary to ligate small vessels to stop hemorrhage. In the majority of cases application of sterile swabs will accomplish the same results. The periosteum should now be gently pushed out both ways from incision, and retractors used; now the eminence over the root of tooth can be plainly seen, the radiograph having established the extent of the area involved and the position most suitable for entrance to area.

The external plate and spongy process over the roots of the eight anterior teeth vary from one-half millimeter to two millimeters. Thoroughly expose the root with small chisels (mastoid chisels). With a fissure bur, cut across the root at incisal end of area involved; remove the part of the root severed, then thoroughly curette diseased bone; with small files round up the end of tooth, then a hot instrument should be used to sear the gutta percha root filling. In the majority of cases the two flaps of wound will approximate when the retractors are released. But where there is extensive osteomyelitis both ends should be stitched and an iodoform gauze stringer left in such a manner that it can be partly removed each day for about three days.

Cleft Palate.
By Wm. L. Shearer, Omaha, Neb.

Patient, girl about twenty-seven years of age. This was a very large cleft on the soft parts, extending anteriorily almost to the teeth. It was treated entirely by one operation, no lateral incisions being made anywhere in the palate. I have received several letters from this young lady, whose name was Freda Schultz, stating that she had made a fine recovery and that she was improving day by day in her speech, and that she was now able to take her stand in the world among other people and carry out the line of study which she planned but was unable to do on account of this unfortunate condition. The material left in the mouth when completed was silver wire, lead plate for tension sutures, and horsehair for co-aptation sutures.

Surgical Clinics.
By Dr. Truman W. Brophy.

Dr. Brophy operated upon three patients. A young woman, with harelip and complications was one. This lip had been operated on previously, but was very abnormal and greatly disfigured by scars. He removed the scar tissue and readjusted the lip so as to bring it into normality. The second case was a child with cleft palate. The operation consisted in uniting the separated portions of the soft palate. The third was a child with cleft palate. He operated upon it by bringing the bones into proximity.

Radical Operation, Antrum of Highmore.
By Adolph Baer, San Francisco, Cal.

Local anesthesia by injection, using ten c.c. of a two per cent. novocain solution.

Incision beginning at median line and extending parallel with the gingival margin one-half inch above it; joined by a perpendicular incision in median line. Mucosa at periosteum elevated exposing anterior wall of antrum, and anterior, external margin of nasal orifice. Mucosa freed from nasal surface of naso-antral wall. Chisel opening made into antrum through canine fossa and entire antral wall removed by means of Hajek forceps. Bone removed separating nose from antrum beginning at anterior nasal orifice. Pus washed from antrum which is then cleared of all polypoid and hypertrophied mucous membrane. An inverted "U" shaped flap was turned down from naso-antral mucosa on to floor of antrum and held in position by means of packing. Incision closed by means of silk sutures; end of packing allowed to protrude through incision into mouth. Packing removed at end of eight days.

Surgical Clinics.
By A. C. Rasmussen, La Crosse, Wis.

Mr. G. McCready, Age 19.

A case of congenital cleft palate and harelip. The cleft in the palate extended through the soft palate forward to the alveolar ridge. Harelip had been operated upon a number of years ago and closed. The palate was closed using the Brophy operation by raising the soft tissue from the palate bone, bringing them together by means of silver wire tension sutures and lead plates and bringing the margins into apposition with horse hair sutures, relieving all strain on the latter sutures by means of the lead plates and silver wire.

H. S. Age 6 Months. A case of congential cleft of the alveolar ridge and harelip. Lip had been previously closed. Nose was flattened and drawn to the side of the cleft. Operation consisted of raising the tip of the nose and drawing in the ala of the nose on the affected side, thereby straightening the nose. A peculiarity of this case was that the left nares was entirely closed, probably due to previous operations; this, of course, was opened during the operation.

G. P. Age 4 Years. A case of congential double cleft of the palate and a double harelip; two operations had been previously performed, the lip having been closed and the premaxillary bone thereby drawn back approximately into position; a fibrous union having taken place between it and the maxillary bones. Much loss of tissue had occurred as a result of the sloughing after previous operations. However, the tissues were raised from the palate bones according to Brophy's method and by careful manipulation enough tissue was secured to bring the edges into apposition; the lead plates and wire sutures were again employed, bringing the edges firmly together; horse-hair sutures were used to approximate the edges of the soft tissue neatly.

M. S. Age 31 Years. A case of congenital cleft of the soft palate and posterior third of the hard palate. The previous operation had been performed a number of years ago; patient reported that sutures had sloughed out. Patient had suffered repeated attacks of quinsy, so much so that the field was a solid mass of cicatricial tissue. The tissues were dissected as well as possible, loosening them from the surrounding structures; the silver wires and lead plates placed in position; the edges brought together by drawing up the silver wires and the horse-hair apposition sutures placed.

J. D. Age 22 Years. A case of congenital cleft palate extending through the soft palate and forward two-thirds of the hard palate. A very wide cleft. Typical Brophy operation was performed, raising the soft tissue from the palate bone, bringing them together by means of the silver wire sutures and the plates and placing horse-hair sutures to approximate the freshened margins. In this case as no previous operation had been performed the resulting palate was as long as could be desired.

Operation by Dr. C. H. Oakman and Dr. A. T. Rasmussen.

J. K. Age 1 Year. A case of complete congenital cleft palate and harelip, the pre-maxillary bone being attached to the left maxillary bone and protruding for-

ward very markably. The deformitv was reduced by placing wire sutures through the maxillary bone high up above the alveolar process passing them through from one side to the other. Two of these were placed, one anterior to the other, the posterior one being in the region of the molar teeth; lead plates were fitted over these and two of the wires drawn up and twisted tightly; the other two wires were carried forward over the premaxillary bone, which it was found necessary to fracture from the maxillary and malar bones in order to bring it into position. After the bones had been freshened they were pressed into position and the silver wire tightly twisted together over the lead plates in a manner to emobilize the bones in their new position. The operation was performed according to Brophy. Sutures were placed in the muco-periosteum over the union between the bones to give as even a surface as possible.

Implanted Artificial Roots.
By Dr. E. J. Greenfield, Wichita, Kans.

In performing the operation of implanting artificial roots, I do not try to see how quickly I can do it, but take my time. First, I wash the ridge to be operated on with alcohol or ether, and paint tissue with tincture of iodin.

I next use instrument No. 1, known as the gum cutter. This is placed in the engine to remove the gum tissue.

Next use instrument No. 2, known as the bone facer. This is used in the same way as the gum cutter, and enough of the bone removed to allow part of the gold portion of the root to be imbedded in the bone.

Next use instrument No. 3 and sink it into the bone as far as it will go. Safety device prevents it from going too far. This incision is made to allow the shaft carrying the saws to enter it. This saw makes an incision exactly the size of the wire used in the root.

I now remove saw and place at right angles, and make another incision. This gives a socket resembling a cross. Now wash out the particles of bone, and make a paste of iodoform and oil of eucalyptus; coat root with this, and place it into socket just finished. This root should fit into the socket very snugly. Now take a mallet and drive root gently into place. After this, paint the tissue again with tincture of iodin.

The patient is now dismissed for a period of from six to eight weeks, to allow bone tissue to form through this platinum root before setting a crown or bridge. This operation I perform almost entirely with novocain and adrenalin, as I find that it is much easier to do this opera-

tion when the patient is able to assist by keeping the mouth free from blood.

Case No. 1 of this clinic, is a lady who had all her teeth extracted, and after several years, found it impossible to wear a lower plate. I implanted six artificial roots, and have mounted on them, a full bridge, which is giving perfect satisfaction. This patient is about thirty-nine years of age.

Case No. 2 is a lady with all the posterior teeth back of the cuspid on the right side missing, and all on the left side back of the first bicuspid. Above on the right side, all missing back of the cuspid. This patient is forty years of age, having lost these teeth by the ravages of pyorrhea.

Exodontia.

Extractions Under Local Anesthesia, Followed by Studying of Gum Tissue.

By Dr. John D. Eckes, San Francisco, Cal.

The object of this clinic is to illustrate my method of extracting and care of patient after extractions. It has always been my highest aim to do this character of work in such a way as to render the patient most comfortable after the operation.

My method is to inject novocain, remove the teeth, wash out and wipe out all sockets, removing all spiculæ and infected material, then fill sockets completely with Beck's bismuth paste, in which is incorporated ten per cent. of iodoform; then massage the tissues together as closely as possible, which will remove all excess paste; then suture, using No. 0 catgut suture in a small full curve oculist's needle. One stitch is all that is necessary, unless tissues have been badly lacerated.

We proceeded to extract teeth for five or six different patients. I will mention but one case in particular, a badly impacted third molar. This was a very interesting case which illustrated the use of the anesthetic and the care necessary to perform such an operation without lacerations. We used the peridental method of anesthesia, injecting antero-buccally, lingually and distally, securing perfect anesthesia for at least a half an hour. We then proceeded to cut off with small cross-cut fissure burs the anterior quarter of the tooth, which lay directly under, and in contact with, the protuberance of the second molar. This done, we proceeded to loosen the tooth with a small elevator, then with lower alveolar forceps we turned the tooth two-thirds of a circle in removing, leaving the gum tissue in perfect condition with no lacerations. We then followed the operation by cleansing and suturing as described above.

This clinic was repeated September 8th, Dr. George N. Hein giving the local anesthetic. Again several cases were handled successfully, illustrating particularly long sustained anesthesia and extraction of badly impacted molars and teeth with roots badly exostosed with the minimum amount of laceration. One case in particular, a young lady who is studying dentistry was interesting. The radiograph showed a lower left third molar entirely impacted, indicating the roots apparently regular in form, but which proved to be very deceptive. The parts were com-

pletely anesthetized by three injections around the tooth by gently tapping the needle deeply into the process; we then proceeded to lance the tissue to expose the crown of the tooth. We then used an Ash elevator to partially loosen the tooth, but without success until we had used a cross-cut fissure bur to cut away a little of the process buccally and anteriorly. We then succeeded in working the tooth out a little by means of the elevator and then with the alveolar forceps we gradually teased the tooth from the process without breaking the root, or lacerating any tissue. The suturing process as above described was again used, closing the tissue over the socket. The same patient had on the opposite side of the mandible a badly infected first molar, the radiograph showing infection at the apex of each root. In this case, in order to produce complete anesthesia we made an intra-osseous injection low down in the process anteriorly of the mesial root. The case was a very difficult extraction, on account of exostosis, but we succeeded in getting them both out clean with no laceration of gum tissue; then sutured as usual.

Exodontia.

By Ashley Albert Shaw, Los Angeles, Cal.

1. Upper right first bicuspid roots, gum tissue overlapping, widely bifurcated. Upper right second molar roots, division of roots, and removal of same, singly, nitrous oxide and oxygen (time, one minute eight seconds).

2. Upper left first molar, broken down, and second bicuspid, upper right palatine root of second molar. Nitrous oxide and oxygen, (operating time, one minute).

3. Woman aged sixty. Lower central root. Nitrous oxide and oxygen; no discoloration; recovered in three minutes to normal.

4. Lower right second molar root dove-tailed by crowns of first and third molars. First bicuspid lower right root decayed below margin of gum, upper right second molar, upper left second molar. Lower left cuspid and first bicuspid roots decayed below margin, no lacerations. Nitrous oxide and oxygen. This patient an alcoholic, a man of bilious nervous temperament, consequently hard to anesthetize and handle. Normal in five minutes (nitrous oxide and oxygen).

5. Man. Upper first bicuspid roots (abscessed) and second bicuspid exostosed. Alcoholic. Nitrous oxide and oxygen, hard to handle. Normal in three minutes.

6. Man. Bilious temperament, upper right third molar roots, first and second bicuspid roots. Nitrous oxide and oxygen, slight cyanosis, recovered consciousness on removal of inhaler, felt no pain, normal in three minutes.

7. Woman, invalid, fifty-eight years old. Lower left third molar root. Nitrous oxide oxygen, no discoloration. Returned to consciousness quickly, slight nausea. Normal in ten minutes.

8. Dental student. Nitrous oxide and oxygen. Impacted lower right third molar. Patient quickly recovered. Operating time ten seconds.

9. Man. Lower third molar, upper right bicuspid root. Nitrous oxide and oxygen, normal in three minutes.

I have placed the time required for each case, as the instruments and technique have not heretofore been devised and constructed to enable a dental operator to accomplish this end. These mouths were examined by many dentists at the operating chair before and after operating, and all were surprised at the absence of any laceration. It has been shown in the adoption and proper application of these hand form handled elevators, which I have devised that they are instruments that are foolproof.

Impacted Lower Third Molars, Technique.

Clear field buccally and posteriorly with elevators; during instrumentation, tooth will be loosened. This is the time to determine the line of least resistance. With elevator apply semi-circular force to lift tooth upwards, backwards, and out.

Semi-circular force as used with this system expresses an applied force associated with the technique deciding the lines of least resistance relative to impacted third molars. These elevators are applicable to all roots in the upper or lower maxilla, as was shown in previous cases at the clinic.

This clinic has been a demonstration in removing roots and teeth, including impacted third molars, using the Shaw hand form elevators, and without lacerating gum tissues, or having to use any other instrument.

Instruments of a similar nature have not heretofore been constructed to enable a dentist to accomplish this end in a masterly way. I wish to report the fact, that I have not in thirteen years, while practicing exclusively as a surgical dental specialist, removing from two to ten impacted third molars a week, required the use of a dental engine to start or complete the removal of impacted third molars. With the technique and instruments there will be no torn gums, or process removed, and the time required is from ten seconds to fifteen minutes.

Radiograph of and Specimens Removed with Compound Follicular Odontoma.
By Dr. S. B. Fontaine, Oakland, Cal.

An odontoma is a tumor composed of one or more of the dental tissues arising either from tooth changes, or teeth in the process of development.

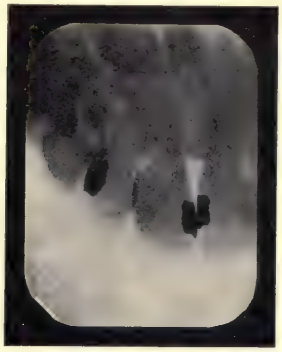


Fig. 1.

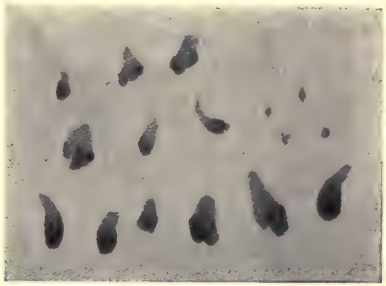


Fig. 2.

The causes are a perversion of development leading to a division of the structures or cellular elements from which tooth germs are developed, resulting in abnormality of form and character through which several kinds of tumors occur.

The compound follicular odontoma, according to Sutton, is a result of a sporadic calcification of the thickened and enlarged capsule of the tooth. By this sporadic calcification of the capsule there is developed within the tumor, a small number of small teeth or denticles, which are more or less malformed and composed of dentin cementum and enamel.

Dr. Weeks reported a case having eleven denticles; Marshall records a case having five denticles; Tellander reports a case having nine individual and six masses of dental tissue, having the appearance of a union of several single teeth.

The case which I am presenting is that of a young lady, twenty-two years of age, which I treated last April.

The patient had a slight fulness on the left side of the face with transient neuralgic pains. The surrounding teeth were vital and in good condition.

As there were no external causes for her condition, a radiograph was taken, Fig. 1, and as you see, clearly shows the trouble; an encapsulated mass extending from the left central incisor to the first bicuspid on the same side, and in this mass are many little white specks.

The diagnosis in this case was that of compound follicular odontoma. Under conductive anesthesia the mass was removed and seventeen denticles were found. They were of various sizes and shapes. (Fig. 2.)

During the operation the patient was perfectly comfortable. She had practically no after pain, and the recovery was uneventful.

These cases, though benign, may become malignant. Therefore, an early diagnosis and thorough extirpation of the tumor is an essential procedure. This also proves that a good radiograph is absolutely necessary for a proper diagnosis, and that no doubtful cases should be treated without first having a good X-Ray plate.

Exodontia.

U. Grant Bartlett, San Francisco, Cal.

The object of this clinic was to demonstrate, what to me seems the easiest method of extracting an impacted or malposed lower third molar.

Technique. Short incision on distal line of second molar buccally; short incision distally of impacted molar on median line. Dissect tissue disto-buccally. With small round bur cut away process around the same border sufficiently to allow elevator point to be inserted under crown of tooth.

Apply pressure sufficient to loosen imbedded tooth; then with suitable forceps roll tooth buccally and it will often be a surprise how easy extraction is accomplished.

Keep away from lingual wall; also be careful not to go too deep under the root of tooth as it is easy to sever dental artery or nerve with bur in event of which the hemorrhage is sometimes difficult to control.

For anesthetic, inject about ten mm. of two per cent. novocain and adrenalin solution in disto-buccal border, making two punctures. This is generally sufficient to permit cutting away of tissue without pain. Then anesthetize with N_2O and O to remove the tooth.

In cases where there is inflammation, pus and considerable swelling, I do the entire operation under general anesthetic, using N_2O and O. sometimes adding a little ether, which gives a more profound and satisfactory anesthetic.

Post Operative Treatment. Irrigate and flush cut cavity with warm normal salt solution; dress with iodoform gauze; pack with but little pressure, allowing cavity to close as rapidly

as possible. Dressings should not be allowed to remain more than forty-eight hours.

Surgical cleanliness and antiseptic precautions are very necessary in this operation.

Removal of Impacted Third Molar.
By O. T. Dean, Seattle, Washington.

Preparatory to the operation it is well to wash the mouth with an antiseptic solution, and paint the gum tissue with iodin. The most desirable anesthetic for removing impacted lower third molars is novocain conductive anesthesia, induced by blocking off the inferior dental nerve at the mandibular foramen.

Fig. 1.

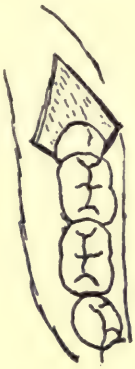


Fig. 2.

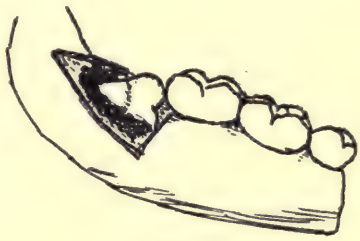


Fig. 3.

The first step in operating, is the incision. The incision should follow just inside to the ramus, and as the ramus deflects outward, the incision should take this course. (Fig. 1.)

If the tooth is imbedded very deeply, a short incision both buccally and lingually, should be made just distal to the second molar, thereby preserving the attachment of this tooth. (Fig. 1.)

The incision should extend through the periosteum, and the periosteum should be elevated. The flaps of gum tissue are retracted (Fig. 2), and the process removed around tooth by use of an ordinary round bur, from No. 10 to 15. The surgical burs have no advantage.

To remove the tooth most of the bone should be dissected away lingually, as the bone in this region is thin, which requires less cutting, and does not weaken the jaw so much. (Fig. 3.)

I begin cutting the third molar well back to the neck, this prevents

the trauma of the gums, as well as injury to the second molar with stone or bur. I start the cut with a small knife edge stone, and then use a large cone fissure bur in right angle to complete the cutting. Cut until you are almost through the tooth in all directions. Take a chisel or an elevator,

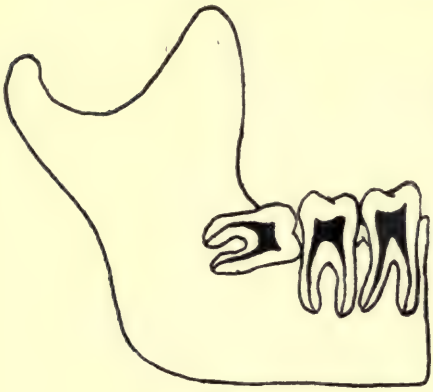


Fig. 4.

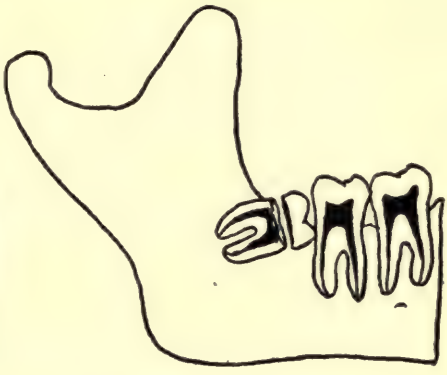


Fig. 5.

Fig. 6.

Fig. 7.

insert in the groove, and pry gently, and you can easily separate the two pieces of tooth. Should you pry too hard before you cut the tooth through, it is likely to break through to the occlusal surface of tooth instead and the remainder will be more difficult to cut and remove. (Figs. 4 and 5.)

The crown is now readily removed. Be careful not to cut the roots too low down, so that they cannot be engaged with elevator, or forceps. (Fig. 6.) After the two parts are removed, wash out socket with warm

normal saline solution, and use a small curette to remove all chips and fragments of bone.

Novocain powder is now placed in the wound, and then closed by two or three stitches. (Fig. 7.) If the soft tissues are elevated just a little beyond the border of the bone, it will assist in allowing the flap to cover the socket.

Never pack a socket with cotton or gauze. It the socket does not fill with blood, stimulate bleeding by the means of an instrument on the raw edges of the gum.

To prevent contraction of gum from second molar bring ends of nearest suture around and tie. (Fig. 7.)

Notes on Radiographs and the Surgical Treatment of Septic Teeth and Alveolar Process.

By Josef Novitzky

An Impromptu Lecture Delivered by Request.

The radiograph is supremely important in assisting the dentist in diagnosis. It has made possible the anticipation as well as the diagnosis of bone lesions that would otherwise escape notice. It has enabled us to recognize dental canal and antral complications, while they are practically in a quiescent state. It has been the means of locating softened disintegrated areas in bone. It shows impactions and fractures in their true conditions.

But in spite of the diagnostic help which the Roentgen ray has been in the practice of dentistry, there are still many men who either refuse absolutely to accept Roentgen ray findings or else accept them so half-heartedly as to minimize their value. This is perhaps natural on account of lack of experience, the wrong view of the relation of the radiograph to clinical symptoms, and the unduly emphasized errors in Roentgen ray work. The value of the radiograph is often not perceived because ability to read and interpret it depends on experience and mature judgment both in the interpretation of the radiograph and in the actual practice of surgery. The radiograph is opposed, too, by men who have the notion that its advocates would relegate clinical symptoms to the scrap heap. The advocates of radiography, however, would use it in conjunction with clinical symptoms, which should be checked up accurately and added to the Roentgen ray findings. Finally the radiograph has been opposed because it is subject to error. Errors in this work, constantly pointed out, serve a good purpose in deterring inexperienced men. These errors are generally due not to the radiograph but to the mental equation of the diagnostician. Hence, they should not blind us to the good results to be obtained in many cases by its use.

By use of the Roentgen ray I have come to hold certain views to which other men give no strong support. These views, nevertheless, will become convincing, I think, if they are studied in connection with the radiographs here reproduced.

Extraction Preceded by Radiographic Examination.

Before many years have passed, to extract dead, septic teeth without first submitting them to the Roentgen ray will be regarded as malpractice. All extractions of dead teeth should be preceded by radiographic study. If this study indicates any

Fig. 1-A. Before operation. Dental canal under second and third molar distorted in contour. Found necrotic.

septic involvement of the alveolar process or of the jaw proper, the gums and the periosteum should be lifted and retracted; and the outer plate of bone over the tooth roots should be removed, allowing the roots to be used as a guide to any necrosed structure at their apical regions. The necrosed structures can then be readily removed with the curette, preceding or following the tooth removal. The opening of the parts to direct vision according to this technique may bring to light areas of discolored, eburnated, or disintegrated bone involving the apical region. If the dead tooth is a molar, the septum will frequently be involved. Immediately below this the bone will be considerably eburnated, and the alveolar process will lose its cancellous appearance. These and other pathological changes would generally escape notice unless the technique I advocate was followed. Also it would be impossible to ascertain these

conditions before operating without the use of the Roentgen ray. If you operate without first knowing whether there is any jaw involvement you may find that there are no pathological conditions present.

You may say that you have "pulled" dead teeth for years; that the gums heal over, sometimes a little slowly; that after a few months the

Fig. 1-B. After operation. Outer plate of mandible removed down to dental canal from a little anterior to the anterior margin of massite muscle to inferior dental foramen.

gums are pink and firm; and that no bad results are to be seen. Of course, they are not to be seen because usually the patient will not seek relief until several years later. Then you would probably not recognize the lesion, whatever it might be, as in any way related to an area of infected alveolar process even if you knew the area to be present.

In some old cases the radiograph will fail to indicate the source of trouble in the alveolar process on account of the eburnation which often takes place. Some years after ordinary extraction of a necrotic tooth, an exploratory operation, carefully performed under local anesthesia, will generally show disintegrated bone deep in the jaw at the site of the old extraction.

The radiograph is of the greatest value in indicating an area of disintegrated bone because no other diagnostic help in use at the present

time will clearly indicate such areas, and also because such areas often result in secondary systemic lesions.

The primary source indicated by the radiograph may be removed in some cases by tooth extraction; in other cases it may be partly removed by tooth extraction; possibly blind curetting following extraction will

Fig. 1-C. Three years after operation. Showing reformation of bone.

be of considerable help in some cases, but this would not offer the high percentage of success that the dissection with direct vision would offer.

The accompanying illustrations will serve to show the value of the radiograph in discovering bone lesions in certain typical cases. The notes about the subjects of the pictures will serve to show how positively necessary may be the removal of areas of disintegrated bone.

The three radiographs of Fig. 1, picture a typical case treated by me in consultation with Dr. Von Der Leith. The first (Fig. 1A), shows a radiolucent area involving the dental canal.

The subject was absolutely free from any systemic taint that could be responsible for his trouble. His Wassermann's were all negative. There was no history of industrial poisons. He had been examined carefully by physicians who found no definite cause of the trouble.

About eight months before the trouble began some dead molars had been extracted. The gums had closed over the sockets very slowly, but eventually the soft parts were firmly united. Some months later a swelling had appeared over the inferior dental foramen. The patient had punctured the swelling with his finger nail. Pus had drained from the

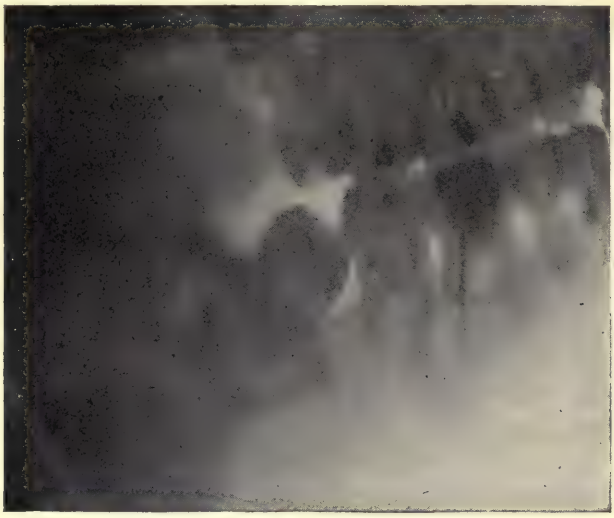


Fig. 2-A

inferior dental foramen through this puncture for many months. There had been excessive pain, but finally the pain had disappeared and the lower lip had become numb on one side.

Case I. Mandibular Bone Regeneration.

The second radiograph (Fig 1B), shows that the entire body of the mandible has been removed by operation down to the dental nerve. The nerve had long since disappeared in company with the blood-vessels. The third radiograph (Fig. 1C), made three years later, shows new bone with practically a normal sized mandible. The canal, of course, is obliterated. This plate should convince the most skeptical that alveolar process does regenerate.

Case II. Arthritis Relieved in Jaw Surgery.

Fig. 2, A, B, and C, pictures a case of necrosed alveolar process in the upper jaw, involving the antrum. Dr. Truman Brophy and Dr. M. H. Cryer agree that there are thousands of such cases with no apparent indications of the conditions. Pus is not

always generated in such quantity as to induce the classical clinical picture of acute suppuration. But enough is generated to run a slow chronic course, with slow systemic absorption. There is frequently no local evidence of the disorder but there may be grave systemic symptoms.

The subject was in the St. Francis Hospital, San Francisco, for

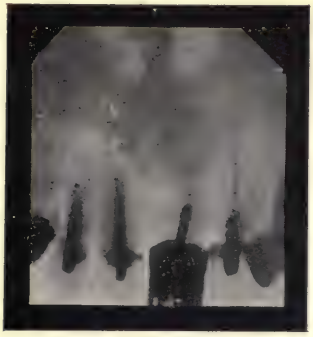


Fig. 2-B

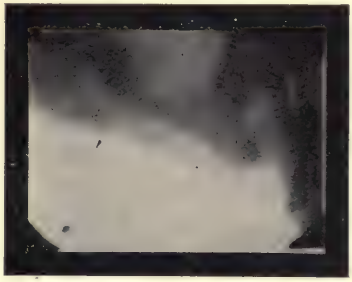


Fig. 2-C

about two months with severe arthritis. He suffered so intensely that it was impossible to touch him. It was necessary to anesthetize him before the radiograph could be taken.

His third lower molar was impacted (Fig. 2A). All of the bone around it was destroyed. There were apical abscesses of most of the upper incisors (Fig. 2B), and there was much necrosed alveolar process involving the left antrum. His hip had been opened; inflamed structure was found but no pus. After the source of infection in jaws was removed the patient improved so rapidly that in a few weeks he could walk with crutches and a short time later he could walk without them. This case would have convinced the most skeptical that improvement did follow jaw surgery.

Dr. Carl Hoag's report of this patient reads as follows: "The patient reported with a tendo synovitis of the right hand, the inflammation lasting about four weeks. At the end of this period an osteo arthritis of the right hip developed. This lasted two months and did not clear up until the antrum and jaw conditions were operated. The hip was explored, but no pus found, only congested membranes. All other sources of infection, prostate, tonsils, air passages, appendical and intestinal sources of infection were eliminated. The Wassermann was negative. Following the implication of the hip joint, the patient developed an osteo arthritis of the spine in the lumbar region. These conditions all cleared up when the sources of infection in his jaws were removed."

This is a remarkably complete history. Without the Roentgen ray a diagnosis in this case would have been almost impossible. Many other complete histories in my possession indicate the value of radiography in diagnosis. They indicate also that improvement follows jaw surgery in many cases.

Fig. 3.

Case III. Bone Sepsis in Pyorrhea Case.

Fig. 3 shows an old septic area in the body of the mandible with a metastatic pyorrhea of the anterior teeth. Any treatment of this pyorrhea that would ignore the septic center in the body of the mandible would naturally be followed by a recurrence of the pyorrhea.

In many pyorrhea cases like this one, the intelligent use of the radiograph will show bone sepsis. A septic center in a jaw may contaminate the entire blood stream of the jaws. It may cause the blood-vessels to become thrombosed and sclerosed. The blood supply is interfered with. The local resistance becomes so low that an ideal field is furnished for a pyorrhea that cannot be cured by scaling or by the introduction of drugs into the blood stream.

The radiograph indicates the need for *surgery, drainage, through ventilation, and immobilization by putting the teeth in splints and treating them as you would treat a fracture.*

I believe that no one pathogenic organism can be blamed for the destruction in pyorrhea cases. The average persistent case of non-traumatic pyorrhea that is not intimately associated with sepsis in some part of the jaws or upper air passages, will be found associated with

systemic cachexia or suppurative or toxic disturbances of other parts of the body.

No one should expect a permanent cure until the cause of the pyorrhea is removed.

If a septic center in jaws or air passages causes teeth to be afflicted

Fig. 4.

with metastatic suppurative sequelæ or joints to be afflicted with arthritis, it is absurd to treat the symptoms by way of the blood stream, without a removal, or attempted removal of the direct cause.

I am not referring merely to those cases obviously caused by the traumatic irritation of a filling, a crown, a bridge, or a plate.

Pyorrhea, when once it reaches the acute stage with fibrous degeneration of the sockets and resorption of the alveolar process, is practically incurable. The teeth cannot be immobilized. The patient must use them. We know that it is impossible to secure union in an infected fracture while it is swinging about at random. So it is impossible to secure union in cases of advanced pyorrhea, even if the cementoblasts and other genetic cells still retain their normal vitality and identity.

The periosteum may loosen and detach itself from the long bones of a horse after hard galloping on hard ground. Very much the same thing

happens with the few teeth that are left in position in advanced pyorrhea cases. The forces of occlusion being centered on a few teeth soon cause inflammatory changes in sockets and alveolus. Since we cannot treat such cases by immobilization and rest, it is fundamentally important to discover and remove the cause of pyorrhea early.

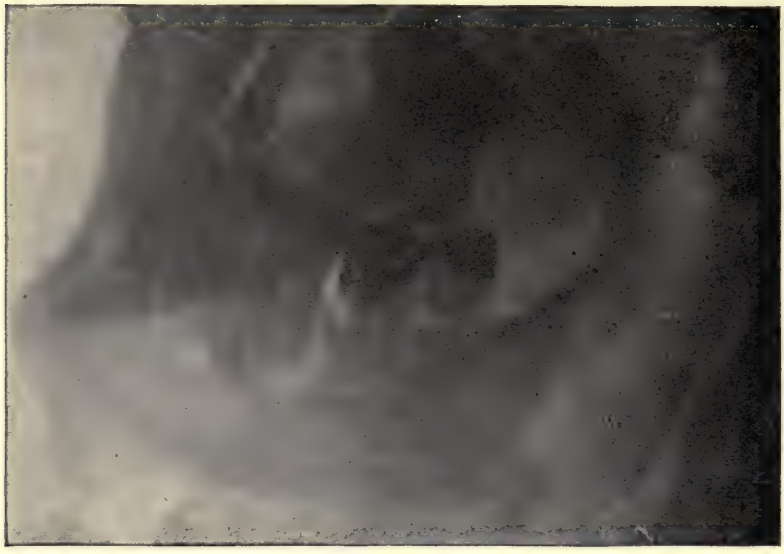


Fig. 5.

Case IV. Tonsil Infected from a Tooth.

The subject of Fig. 4 had been treated for acute tonsillitis. A swelling of the soft tissues extended up to the mastoid portion of the temporal bone; the parotid gland was involved as well as the submaxillary triangle. The radiograph in this case shows a little round hole in the mandible. There was undoubted posterior drainage from the dental canal into the tonsillar region. The periosteum is so firmly adherent and the integument so unyielding in the mental region that drainage does not take place there. The pus drained back and discharged into the tonsillar and sub-parotid region from the inferior dental foramen. The discharge ceased three days after I established drainage through the outer plate of the mandible. When the diffuse inflammation had somewhat subsided, the jaw was opened and thoroughly curetted. After operation the tonsillitis and swelling disappeared.

Case V. Facial Paralysis from Septic Tooth.

Fig. 5 is a radiograph made with a coil at the bedside of a patient afflicted with septic teeth, intense cranial neuralgia, and Bell's palsy. The picture shows three lower molar teeth which were septic and offensive. Eburnation of alveolar process was noticeable. Undoubtedly pressure and septic irritation of the inferior dental nerve was responsible for the neuralgia. The teeth were removed and the jaw was curetted. There was no improvement. At a second operation the jaw was opened up and the inferior dental nerve was removed. No blood-vessels were found. Softened bone was present.

In this case there was doubt as to whether the facial paralysis was a Bell's palsy or whether its origin was in the central nervous system. There was also doubt as to whether it was due to suppurating teeth or to a suppurating mastoid process. The symptoms, however, were typical of Bell's palsy. There was no loss of taste or involvement of other nerves. Blocking the inferior dental nerve with novocain was of material diagnostic assistance in establishing the seat of the neuralgic pain, as there was relief from this during the anesthesia. After the operation on the mandible the patient was soon well.

Case VI. Epithelioma.

Fig. 6 shows an epithelioma case. The history of this case would indicate that the cancer originated in irritation caused by the sharp edges around decayed teeth. The patient had been treated by a quack who applied arsenic paste to the cheek. As a result of this treatment, the cheek was destroyed. The arsenic caused a perforation into the mouth with consequent disfigurement. It caused a severe periostitis of the mandible. Dr. Stanley Stillman closed the cheek orifice by a plastic operation.

The preceding illustrations, and hundreds of others which might be furnished, indicate the importance of the Roentgen ray in discovering septic areas in the jaws.

Novocain Nerve Blocking.

But far more important than the discovery of the areas is the removal of them. The operation I advocate of lifting and retracting the gums and periosteum and removing the necrosed bone with chisel, gouge, or curette should be performed under local anesthesia.

In addition to the novocain blocking in some cases a general anesthetic may be employed to prevent any psychic shock to the patient.*

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* *Technic and Balancing of Local Anesthetics*—Josef Novitzky, Pacific Dental Gazette, March, 1915.

It is now known that work on a nerve trunk will frequently leave the patient with severe headache or cerebral irritations. Even when a general anesthetic is used the nerve should be blocked to prevent any shock caused by the operation from reaching the brain.

In the removing of third molars also I would strongly recommend novocain blocking for the prevention of shock.

Fig. 6.

Novocain injections at the inferior dental foramen will at times, especially if the operator's needle reaches to the posterior border of the ascending ramus, bring about anesthesia of the middle branch of the facial nerve. The periosteum covering the ascending ramus of the mandible is not adherent to the bone. In some instances, then, especially if considerable novocain solution is used, anesthesia of the middle facial supply will be observed. Septic drainage from the inferior dental foramen, assisted by gas pressure would have access to facial terminals.

Bell's Palsy.

Such septic contamination from lower molars is probably responsible for a high percentage of Bell's palsy cases that are ushered in with the assistance of refrigeration. Medical texts make no mention of this fact. Several cases of recurring facial palsy have permanently disappeared following the dissecting out of dead lower molars and involved alveolar process. Acute swellings are not usually observed in these chronic septicemias. In fact, the teeth seldom attract the patient's attention as no subjective symptoms are referred to them.

The infecting organism is usually a streptococcus of low virulence. Pus is not produced, at least not in any noticeable quantity. Absorption of infectious matter from such teeth, however, is frequently responsible for systemic or local trouble.

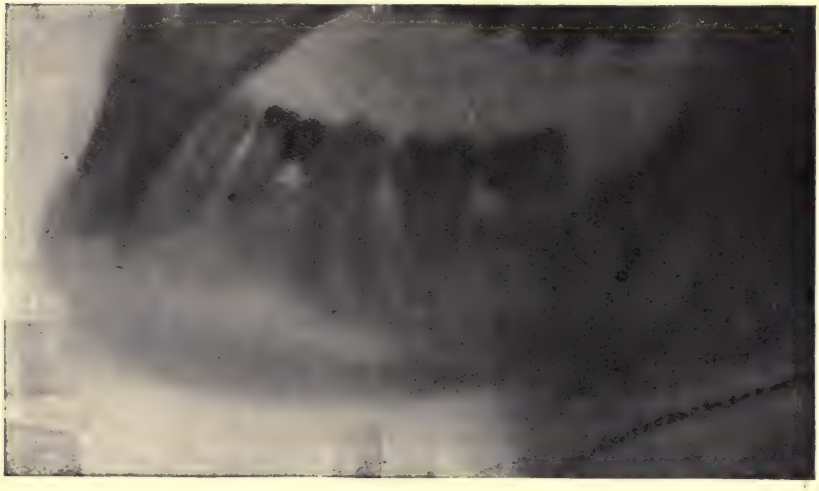

Fig. 7.

Safe Obtunding for Sensitive Teeth.

It might not be out of place to call attention here to Fig. 7, a radiograph taken many months after the use of a paraform-quinin paste in vital teeth to obtund them. It shows absolutely no degeneration nor thickening of structure either in the teeth or in the jaws. The teeth are still vital. The paste used in this case—paraformaldehyde twenty grains, urea hydrochloride and quinin twenty grains, thymol twenty grains, and zinc ozide sixty grains—has been used by me since 1911, for the painless preparation of tooth cavities. I gave it to the dental profession of the Pacific Coast on May 12, 1913. I have tried to make this formula generally known on the Atlantic Coast by means of the *Dental Cosmos,* but this publication would not print it.

The appearance of Dr. Buckley's formula some months later seemed to fill the need for an obtunding paste in the hands of Eastern dentists. Then Dr. Ottolengui published my letter claiming priority in the compounding of obtunding paste in the October, 1915 issue of the DENTAL ITEMS OF INTEREST.

Conclusions.

I have endeavored to point out the necessity of the radiograph in the diagnosis of oral pathology. The preceding plates picture serious septic conditions which would not have been apparent without the use of the Roentgen ray.

Many cases indicate the far reaching effects of the retention of septic matter following extractions of dead teeth in which putrefactive changes have taken place.

I have shown that Bell's palsy commonly is caused by septic drainage from dead lower molars.

Dead septic teeth frequently contaminate the blood supply not only of neighboring structures, but also of distant ones. The result may be a pyorrhea of the dental sockets or an arthritis of distant joints. Removal of dead teeth and necrosed alveolar process often results in a cure of a pyorrhea of neighboring vital teeth.

Dead septic teeth should not be "pulled." They should be dissected out according to the technique I have described.

The dissection should be done under novocain anesthesia.

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